Lockwood Corporation
Gering, Nebraska

Post Closure Permit Application For

Waste Acid Evaporation Pond
EPA I.D. No. NED 044101442

submitted to
Nebraska Department of Environmental Control

prepared by

HWS Technologies Inc.

Revised
June 1989

HWS Engineering Inc.
LINCOLN OFFICE
625 J St., Box 80358
Lincoln, NE 68501
402/475-4241

LETTER OF TRANSMITTAL

DATE	JOB NO.
6-21-89	17-5002-01
ATTENTION: Ms Rita Huff	
RE: Post-Closure Permit Appl. Lockwood Corp.	

TO U.S. Environmental Protection Agency
726 Minnesota Avenue
Kansas City, Kansas 66101

THE FOLLOWING ITEMS ARE: ☐ Attached ☐ Under separate cover via _____

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications

☐ Copy of letter ☐ Change order ☐ As noted ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1			Post-Closure Permit Application Lockwood Corp.

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ No exceptions taken ☐ Resubmit_____ copies for review

☐ For your use ☐ Exceptions taken as noted ☐ Submit_____ copies for distribution

☐ As requested ☐ Revise and resubmit ☐ Return_____ revised prints

☐ For review and comment ☐ Rejected ☐ _____

☐ FOR BIDS DUE_____ 19_____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS _____

COPY w/ATTACH. TO: _____

COPY ONLY TO: Roy Dugan - Lockwood

SIGNED: Donald A Eyberman

52-1(1)

HWS Technologies Inc.

LINCOLN OFFICE
825 J Street, Box 80358
Lincoln, NE 68501
402/479-2200
FAX 402/475-5419

1) Part A
2) not required

June 20, 1989

Nebraska Department of Environmental Control
P.O. Box 98922
Lincoln, Nebraska 68509

ATTENTION: Mr. David Wisch
RCRA Unit Supervisor
Hazardous Waste Section
Land Quality Division

REFERENCE: Post-Closure Permit Application
Lockwood Corporation
Revised

Dear Mr. Wisch:

This referenced Permit Application has been revised and is being resubmitted. The comments contained in your letter of April 26, 1989, to Lockwood Corporation have been addressed, as well as comments noted in the EPA letter of April 21, 1989.

It is our intent that these revisions and additions reflect the conversation and understanding which were arrived at during our meeting of May 12, 1989, with yourself and Sean Brown of the NDEC, and Rita Huff of the EPA Region VII office.

We are hopeful that the revised document will meet with your approval.

Sincerely,

HWS TECHNOLOGIES INC.

Donel H. Kuhlman

Donel H. Kuhlman, P.E.

REGISTERED PROFESSIONAL ENGINEER
DONEL H. KUHLMAN
E-4345
STATE OF NEBRASKA

DHK/sjh
Attachment
57-5002.00
ENVENG5G

Solutions Through Service Since 1944

Lockwood Corporation
Gering, Nebraska

Post Closure Permit Application For

Waste Acid Evaporation Pond
EPA I.D. No. NED 044101442

submitted to
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Revised
June 1989

LOCKWOOD CORPORATION
Box 160 Gering, NE 69341
(308)-436-5051

STATEMENT OF CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to be the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

ATTACHMENTS:

_____ SIGNATURE

_____ NAME & TITLE (Typed)

DATE SIGNED: ____/____/____

TABLE OF CONTENTS

A. FACILITY DESCRIPTION

Lockwood Corporation is engaged in the fabrication of agricultural related machinery, center-pivot irrigation systems, and steel truck bodies. The plant is located in the East 1/2 of the Southeast 1/4 of Section 1, T21N, R55W in Scottsbluff County, Nebraska.

The plant property is presently surrounded by agricultural land on the south and east sides, industrial property on the west side, and industrial and State Highway 92 on the north side. Figure 1 is a location Map showing approximate plant and Facility locations with respect to contours, highways and roads, etc.

The company maintains a galvanizing process as part of its operations. In general, the waste being discharged from the galvanizing process consist of a 5% to 15% solution of waste sulfuric acid. At it's peak operation, the process discharged up to two (2) batches of waste acid per week, each batch having a volume of between 5,000 to 8,000 gallons. Prior to 1984, this waste acid was discharged to two evaporation ponds located southwest of the Galvanizing Building. The cells had bottom dimensions of about 100 ft x 90 ft and 100 ft x 100 ft. At an average liquid of 4 feet, the calculated capacity of the two cells, combined, was about 684,000 gallons.

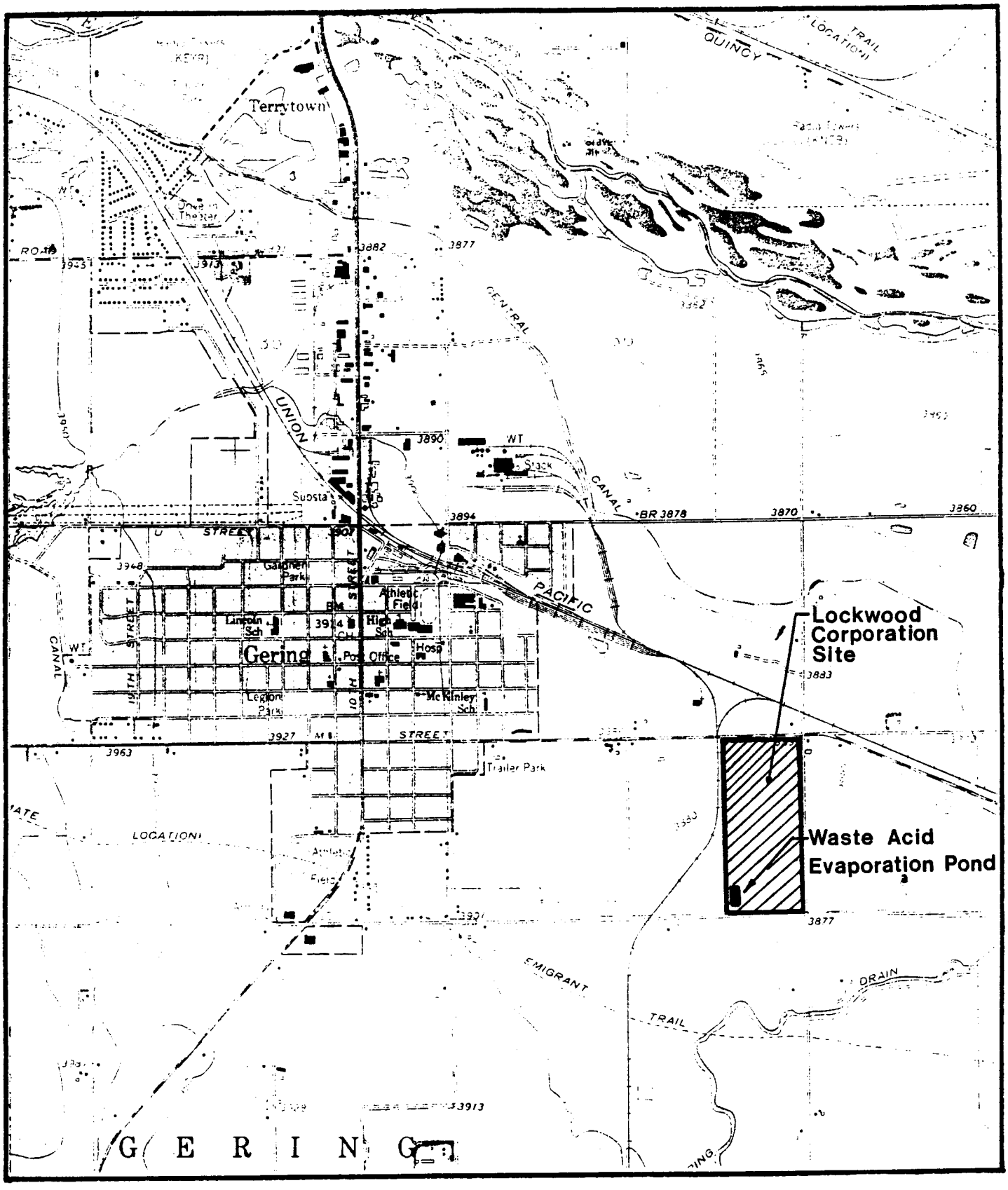
Construction records indicate that the north cell was constructed with a mixed soil and bentonite liner on the bottom and to an elevation of 3 feet above the bottom on the sloped interior surfaces of the dikes. It is assumed that the south cell was unlined since no records were available on this cell and test borings were unable to determine the presence of a liner.

The south cell was placed into service in November 1972 and received wastes until February of 1978 at which time the north cell was constructed and placed into operation. The north cell received wastes from this time until June, 1984, when the discharges to the cell were stopped, as requested by Administrative Order. Since that time, all waste acid has been shipped to a licensed hazardous waste disposal site.

In August 1984, a preliminary Hydrogeologic Investigation confirmed that a leakage occurred in the north cell due to erosion of the clay liner near the influent discharge pipe. Additional investigations defined the extent and severity of the leakage and, in September 1985, a Closure Plan was submitted to the Nebraska Department of Environmental Control outlining procedures and estimated costs for closure of the waste and evaporation ponds.

Also, a Post Closure Plan for the facility was submitted to the NDEC in September 1985. The Plan identified the groundwater monitoring and maintenance activities which were to be carried out after closure.

In October 1985, eight monitoring wells and two monitoring/interceptor wells were constructed around the evaporation ponds. Groundwater samples from these wells have been tested regularly since installation.



SCALE: 1" = 2000'

LOCKWOOD CORPORATION

WASTE ACID EVAPORATION POND LOCATION MAP

FIGURE 1

Closure of the evaporation ponds was performed in November, 1986. The work consisted primarily of pushing the exterior dikes into the center of the cells, thereby covering the contained sludge. Hydrated lime was then spread over the entire disturbed areas and covered with a 6" to 12" layer of compacted silty-clay soil. The soil was then covered with a final cover system consisting of a 20 mil thick PVC liner, 1 to 2 feet of compacted silty-clay soil, and 2 inches of a gravel stabilizing surface layer.

The site was enclosed in an 8-feet-high chain-link fence with proper signing.

B. WASTE ANALYSIS

The waste-acid evaporation pond was discontinued from service in June, 1984. Since that time considerable sampling and testing has been done on the pond sediments, underlying and surrounding soils, and the groundwater in the vicinity. Also, samples were taken of the waste acid from the galvanizing plant, with tests run on them. The results of the testing and a description of the methods and procedures used for sampling and testing are presented below.

1. Evaporation Pond Sediments, Clay Liner, Underlying Soils, and Adjacent Soil Borings

Samples of the pond sludges, clay liner and underlying soils were obtained between June 30 and July 12, 1984. Each of the cells were divided into four equal quadrants. A minimum of five (5) locations in each quadrant were selected at random for sample collection. At each of the selected locations representative samples of each vertical foot of sludge from the top of the existing sludge to the bottom soil and sediment were collected.

In general, samples were obtained by hand excavating the top 1 to 2 feet of material where possible and then driving a modified "Shelby Tube" type core sampling device into the remaining depth of sludge. The tube was driven until the lower soil and sediments would seal or plug the end of the tube allowing for extraction from the hole.

In sample locations where sludges were extremely hard, the top 1 to 2 feet were hand excavated and then the remaining depth was sampled using a gas-driven power type continuous flight auger. All of the sample locations in the south cell (Cell No. 1) were very hard and dry and the auger method was used.

The samples collected were dark brown, yellow, white to blue-green in color. Moisture concentrations for the samples varied from very dry and hard in the south cell to damp and wet in the north cell. The samples from each of the locations in each quadrant were then composited and analyzed. See Figure 2 for locations of sampling quads.

Auger borings of soil surrounding the site were also obtained in June, 1984. These were conducted according to ASTM Designation D 1452-65 (Revised 1980) and sampling was done by split-barrel sampler in conformance with ASTM Designation D 1586-67. The location of these borings are also shown on Figure 2.

RCRA chain of Custody requirements for sampling and transporting were followed for all soil samples taken from the evaporation pond and from the surrounding bore holes. Laboratory analysis of EP Toxicity and Total Metals were done according to standard methods.

Tables 1, 2, 3, 4, & 5 contain the analytical results from analysis of the waste acid, bore hole soil samples, and the evaporation pond soil samples. These results have been presented in the Supplemental Report to the Hydrogeologic Investigation, dated January 4, 1985, which is included in Appendix A.

2. Groundwater Monitoring

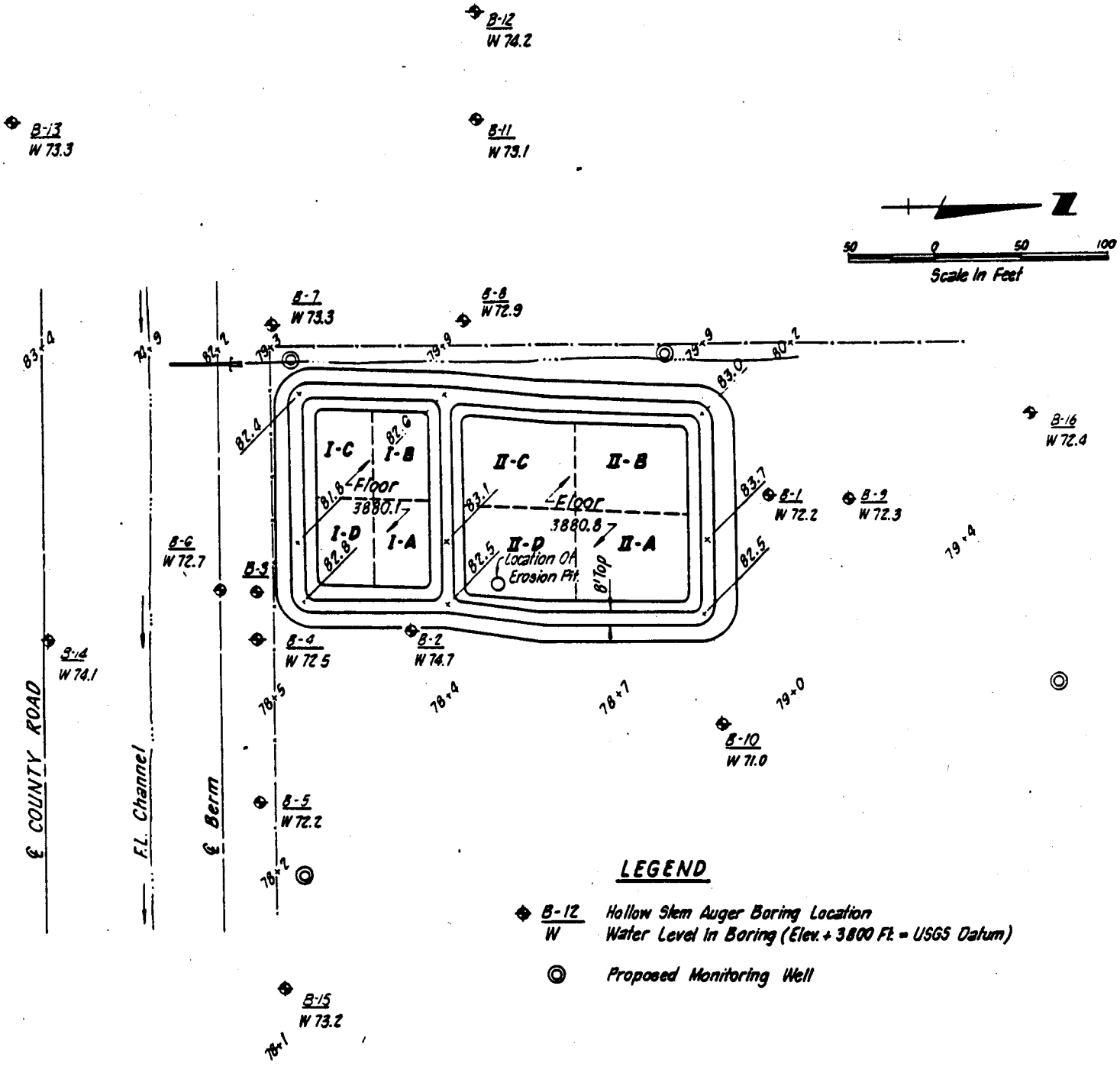
The original Hydrogeologic Investigation and Remedial Action Plan completed by HWS Technologies in 1984, consisted, in part, of sampling and analysis of water from bore holes drilled at the waste-acid evaporation pond site. Also, this report, which is attached as Appendix B, addressed in detail the geology and hydrogeology of the site, including discussions of the aquifers, being studied, the depth and quality of the groundwater, the speed and direction of movement of the groundwater, etc. As a recommendation of that report, eight monitoring wells were constructed in October 1985, the locations of which are shown in Figure 3. These have been used to sample and analyze the groundwater on a regular basis since their installation. Table 6 summarizes the results of water analysis of all the wells from November 1985 to September 1987. At that point the number of wells sampled was reduced to four. Table 7 summarizes the analytical results on those four wells from initial sampling in February 1985 through the most current sampling done in September 1988.

The sampling and analysis of the groundwater will be continued and will be conducted in accordance with the following plan.

3. Sampling and Analysis Plan

Samples will be obtained from the groundwater monitoring system on a regular schedule and be stored, transported, and analyzed under accepted scientific procedures and EPA methodology. Monitoring data will be maintained readily available on-site and summarized in a tabular format for easy reference. Transmittal of results to the State and the Regional Administrator will be done in accordance with 40 CFR 265.94.

a. Monitored Parameters Analysis of samples will be performed for the following parameters.



LOCATION OF SOIL BORINGS AND SAMPLING QUADS

FIGURE 2

HWS TECHNOLOGIES INC.
ANALYTICAL SERVICES
Telephone (402) 475-4241
825 J Street P.O. Box 80358 Lincoln, Nebraska 68501

DATE: June 6, 1986
AUTH.: 84/3937
REPORT NO.: 86702

FOR: Lockwood Corporation
Box 160, E. Hwy #92
Gering, Nebraska 69341

ATTN: Mr. Roy Dugan

1 cc. Roy Elliott, HWS
1 cc. Gary Brandt, HWS

JOB NUMBER: 86-2005

DATE RECEIVED: 3-8-86

CLIENT/FIELD IDENTIFICATION: None Given (Galv. Waste Sulfuric Acid)

LABORATORY IDENTIFICATION NO.: 20547

Analysis	Units	Concentration	Book/Page	Analyst
Physical Properties				
pH	S.U.	< 1	78/86013	RW
Nonfilterable Residue	mg/L	184	80/86008	RW
Metals, Total				
Cadmium	mg/L	20	10/86002	RW
Chromium	mg/L	< 0.05	12/86003	RW
Copper	mg/L	2.0	14/86001	RW
Lead	mg/L	28.0	24/86002	RW
Nickel	mg/L	1.00	23/86002	RW
Silver	mg/L	< 1	3/86001	RW
Zinc	mg/L	67,500	32/86004	RW
Organics				
Oil and Grease	mg/L	< 5	68/86006	SS

Analyses were performed in accordance with EPA 600/4-79-020, Methods for Chemical Analysis of Water and Wastes.

By S R Smith

TABLE 1

SUMMARY OF EP TOXICITY ANALYSES
LOCKWOOD CORPORATION
SITE BORE HOLES

Concentration

LAB I.D. No.		16801	16803	16804	16805	16806	16807	16818
Bore Hole I.D. (Depth, ft)		B1-A (9.0'-10.0')	B1-C (13.0'-14.0')	B1-D (15.5'-16.5')	B3-A (3.5'-4.0')	B3-B (10.5'-11.0')	B3-C (9.5'-20.0')	B5-D (10.0'-11.0')
Parameter	Unit							
EP Toxicity Metals								
Arsenic	mg/l	<0.005	<0.055	<0.005	<0.005	<0.005	<0.005	<0.005
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium	mg/l	<0.005	<0.005	<0.005	0.010	0.030	0.040	<0.005
Chromium	mg/l	<0.05	<0.05	0.10	<0.05	0.07	0.05	<0.05
Lead	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mercury	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/l	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zinc	mg/l	0.05	1.5	1.7	120	230	1200	2.9

LAB I.D. No.		16830	16836	17078	17079	17080	17081	17082	RCRA MAX. CONTAMINANT LEVEL
Bore Hole I.D. (Depth, ft)		B7-C (10.0'-11.0')	B8-C (7.5'-8.5')	B-12 (7.5'-26.0')	B-13 (7.5'-25.9')	B-14 (8.1'-28.0')	B-15 (4.8'-22.5')	B-16 (7.0'-18.0')	
Parameter	Unit								
EP Toxicity Metals									
Arsenic	mg/l	<0.005	<0.005	---------- Not Determined ----------					5.0
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	100.0
Cadmium	mg/l	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1.0
Chromium	mg/l	<0.05	<0.05	<0.05	<0.05	0.13	<0.05	0.14	5.0
Lead	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	5.0
Mercury	mg/l	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	0.2
Selenium	mg/l	<0.005	<0.005	<0.005	<0.005	0.025	0.005	<0.005	1.0
Silver	mg/l	0.1	0.1	---------- Not Determined ----------					5.0
Zinc	mg/l	2.3	0.19	0.05	0.04	0.05	0.03	0.04	------

TABLE 2

SUMMARY OF SELECTED TOTAL METALS ANALYSES
LOCKWOOD CORPORATION
SITE BORE HOLES

LAB I.D. No.		Concentration 17078	17079	17080	17081	17082
Bore Hole I.D. (Depth, ft)		B-12 (7.5'-26.0')	B-13 (7.5'-25.9')	B-14 (8.1'-28.0')	B-15 (4.8'-22.5')	B-16 (7.0'-18.0')
Parameter	Unit					
Cadmium	mg/l	0.005	0.007	<0.005	<0.005	<0.005
Chromium	mg/l	1.65	1.55	2.00	1.56	1.56
Chromium Hexavalent	mg/l	<0.05	0.12	0.15	0.05	<0.05
Lead	mg/l	2.04	2.98	2.38	2.32	1.93
Mercury	mg/l	0.011	<0.005	0.005	0.007	<0.005

TABLE 3

SUMMARY OF EP TOXICITY ANALYSES
LOCKWOOD CORPORATION
EVAPORATION PITS I & II

		Concentration Evaporation Pit I - Composites								Concentration Evaporation Pit II - Composites							RCRA MAX. PERMISSIBLE LIMITS
LAB I.D. No.		17005	17006	17007	17008	17009	17010	17011	17012	16793	16794	16795	16796	16797	16798	16799	
Parameter	Units																
Arsenic	mg/l	0.028	<0.005	0.024	0.006	0.015	0.041	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	5.0
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	100.0
Cadmium	mg/l	0.015	0.015	0.008	0.005	0.025	0.015	0.010	0.025	0.035	0.020	0.030	0.020	0.025	0.015	0.030	1.0
Chromium	mg/l	<0.05	<0.05	0.10	<0.05	<0.05	<0.05	<0.05	0.13	0.20	<0.05	<0.05	0.08	0.12	<0.05	0.12	5.0
Lead	mg/l	<0.1	<0.1	0.24	0.24	<0.1	<0.1	0.12	3.8	1.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.3	5.0
Mercury	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.12	<0.005	<0.005	<0.005	<0.005	0.2
Selenium	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1.0
Silver	mg/l	0.10	<0.1	<0.1	0.1	0.20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	5.0
Zinc	mg/l	150	200	124	100	350	210	150	310	970	660	980	520	930	340	1300	---

* Description of Lab I.D. Nos - See Attached Page

TABLE 4

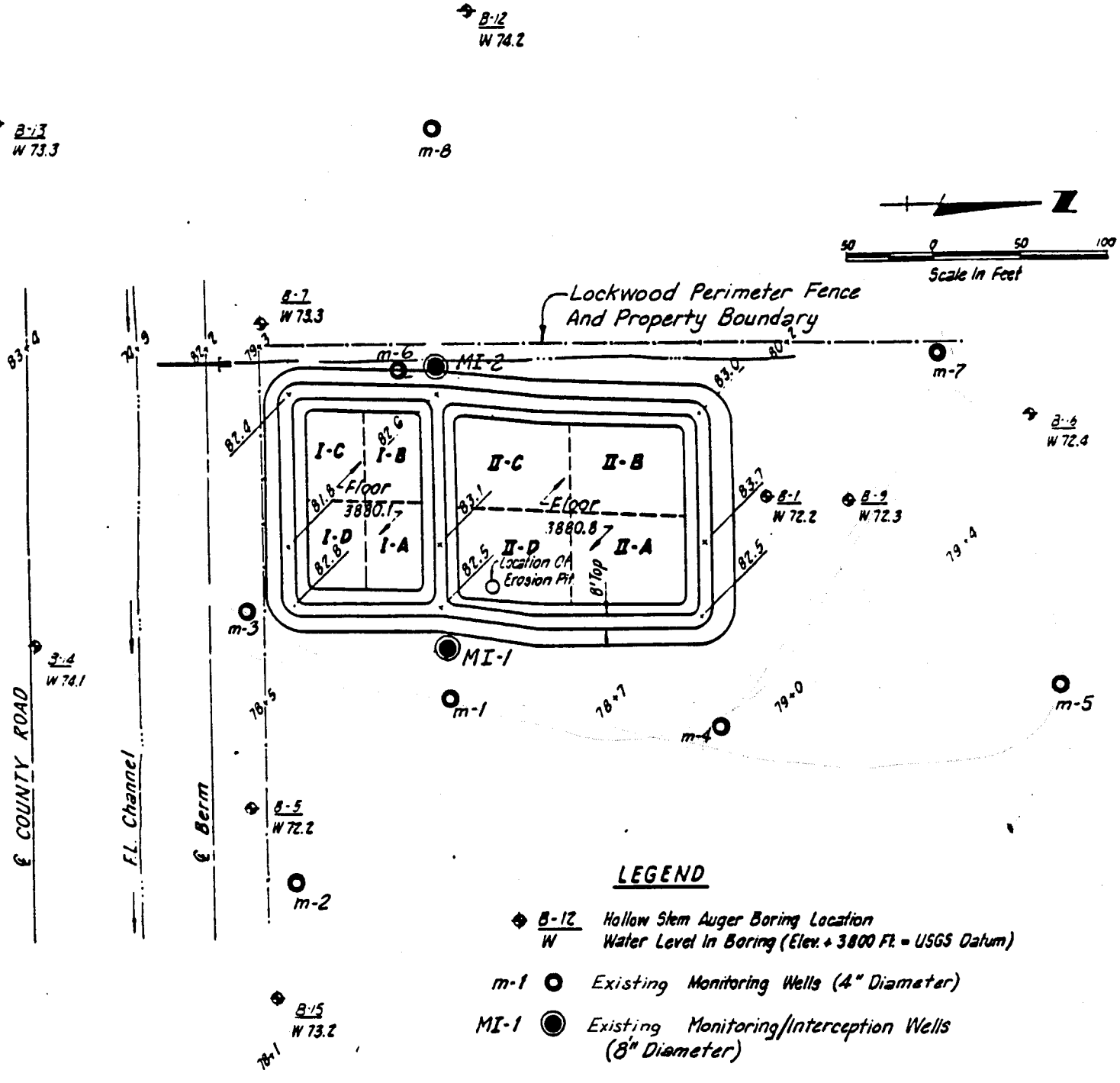
SUMMARY OF COMPOSITE SOURCES
LOCKWOOD EVAPORATION PIT #I

17005	17006	17007	17008	17009	17010	17011	17012
IA-1 (1'-2')	IA-15 (4'-5')	IB-1 (1'-2')	IB-15 (4'-5')	IC-1 (1'-2')	IC-15 (4'-5')	ID-1 (1'-2')	ID-15 (4'-5')
IA-2 (2'-3')	IA-5 (4'-5')	IB-2 (2'-3')	IB-4 (4'-5')	IC-2 (2'-3')	IC-4 (4'-5)	ID-2 (2'-3')	ID-4 (4'-5')
IA-3 (2'-3')		IB-3 (3'-4')	IB-5 (5'-6')	IC-3 (3'-4')	IC-5 (5'-6')	ID-3 (3'-4')	ID-5 (5'-6')
IA-4 (3'-4')		IB-11 (0'-1')		IC-11 (0'-1')		ID-11 (0'-1')	
IA-11 (0'-1')		IB-12 (1'-2')		IC-12 (1'-2')		ID-12 (1'-2')	
IA-12 (1'-2')		IB-13 (2'-3')		IC-13 (2'-3')		ID-13 (2'-3')	
IA-13 (2'-3')		IB-14 (3'-4')		IC-14 (3'-4')		ID-14 (3'-4')	
IA-14 (3'-4')							

LOCKWOOD EVAPORATION PIT #II

16793	16794	16795	16796	16797	16798	16799	16800
IIA-11 (0'-1')	IIA-15 (4'-5')	IIB-1 (0'-1')	IIB-5 (4'-5')	IIC-1 (0'-1')	IIC-5 (4'-5')	IID-1 (0'-1')	IID-5 (4'-5')
IIA-1 (0'-1')	IIA-5 (4'-5')	IIB-11 (0'-1')	IIB-15 (4'-5')	IIC-11 (0'-1')	IIC-15 (4'-5')	IID-11 (0'-1')	IID-15 (4'-5')
IIA-12 (1'-2')		IIB-2 (1'-2')		IIC-2 (1'-2')		IID-2 (1'-2')	
IIA-2 (1'-2')		IIB-12 (1'-2')		IIC-12 (1'-2')		IID-12 (1'-2')	
IIA-13 (2'-3')		IIB-3 (2'-3')		IIC-3 (2'-3')		IID-3 (2'-3')	
IIA-3 (2'-3')		IIB-13 (2'-3')		IIC-13 (2'-3')		IID-13 (2'-3')	
IIA-14 (3'-4')		IIB-4 (3'-4')		IIC-4 (3'-4')		IID-4 (3'-4')	
IIA-4 (3'-4')		IIB-14 (3'-4')		IIC-14 (3'-4')		IID-14 (3'-4')	

Table 5



LOCATIONS OF MONITORING & INTERCEPTOR WELLS

FIGURE 3

LOCKWOOD

MONITORING WELLS ANALYTICAL DATA

DATE SAMPLED	LABORATORY DESIGNATION	FIELD STATION	WATER TEMP (C) (fld)	pH (fld)	SPEC. COND. (um/cm) (fld)	TOTAL IRON (mg/l)	TOTAL MANG. (mg/l)	TOTAL ZINC (mg/l)	SULF (mg/l)	TOTAL ARSEN (mg/l)	TOTAL BAR (mg/l)	TOTAL CAD (mg/l)	TOTAL CHRO (mg/l)	TOTAL LEAD (mg/l)	TOTAL MERC (mg/l)	TOTAL SELEN (mg/l)	TOTAL SILVER (mg/l)	TOTAL SODIUM (mg/l)	NITRATE-NITROGEN (mg/l)	CHLORIDE (mg/l)	PHENOLICS (ug/l)	TOTAL ORGANIC CARBON (mg/l)	TOTAL ORGANIC HALOGEN (ug/l as Cl)
EPA Interim Primary Drinking Water Standards										0.05	1.0	0.01	0.05	0.05	0.0002	0.01	0.05						
25-Feb-86	20528	duplicate	NA	NA	NA	9.60	2.50	0.783	975	0.005	0.53	< 0.005	< 0.05	< 0.10	< 0.0002	0.003	< 0.01	162	NA	30.0	< 0.05	5	< 10
29-Dec-86	21800	duplicate	NA	NA	NA	0.03	1.75	0.010	1500	0.005	NA	0.009	< 0.05	0.01	NA	< 0.002	0.02	140	2.2	29.0	< 5	4	13
27-Mar-87	22079	duplicate	NA	NA	NA	0.03	0.02 <	0.010	260	0.028	NA	0.010	< 0.05	< 0.01	NA	< 0.002	NA	120	6.0	27.7	< 5	4	29
30-Jun-87	22455	duplicate	NA	NA	NA	0.12 <	0.01	0.320	210	0.020	NA	< 0.010	< 0.05	< 0.01	NA	0.002 <	0.01	80	10.3	30.1	78	5	25
28-Sep-87	22908	duplicate	11.9	7.5	1800	3.40	0.32	0.250	480	0.017 <	0.10	< 0.010	< 0.05	< 0.01	< 0.0002	< 0.002	< 0.01	180	11.5	27.4	< 6.0	4	13
07-Nov-85	20025	MI-1	13.5	7.1	2300	1.07	1.08	0.317	700	0.005	0.10	< 0.005	< 0.05	< 0.10	< 0.0002	< 0.002	0.02	260	8.2	32.0	< 0.05	6,7,6.6	22,20,24,30
07-Nov-85	20026	MI-2	13.5	7.6	1340	1.73	0.40	0.050	220	0.017	0.20	< 0.005	< 0.05	< 0.10	< 0.0002	< 0.002	0.03	212	6.4	13.0	< 0.05	5,4.5.5	26,17,17,19
07-Nov-85	20027	M-1	14.0	7.0	2800	5.20	2.50	0.387	1050	0.002	0.20	< 0.005	< 0.05	< 0.10	< 0.0002	< 0.002	0.11	157	1.4	26.0	< 0.05	5,4,4,4	18,22,22,19
25-Feb-86	20520	M-1	11.3	7.2	3800	5.70	2.20	0.491	915	0.004	0.50	< 0.005	< 0.05	< 0.10	< 0.0002	< 0.002	0.08	167	NA	25.0	< 0.05	5	< 20
10-Apr-86	20734	M-1	10.7	6.9	2600	9.16	1.65	0.380	920	NA	NA	< 0.005	< 0.01	< 0.03	NA	NA	NA	148	NA	26.0	0.08	5	< 50
29-Dec-86	21792	M-1	12.4	7.0	3250	6.50	1.60	0.410	1500	0.006	NA	0.009	< 0.05	< 0.01	NA	< 0.002	0.02	157	2.2	29.0	< 5	4	28
27-Mar-87	22071	M-1	10.1	7.0	3250	8.50	2.60	0.390	1500	0.004	NA	0.010	< 0.05	< 0.01	NA	< 0.002	< 0.01	127	3.8	25.5	< 5	4	20
30-Jun-87	22447	M-1	NA	7.1	3950	11.00	2.60	0.870	1300	0.004	NA	< 0.010	< 0.05	< 0.01	NA	< 0.002	< 0.01	127	3.6	23.8	< 5	59	17
28-Sep-87	22900	M-1	13.3	7.1	4100	9.50	2.40	0.340	1500	0.004 <	0.10	< 0.010	< 0.05	< 0.01	< 0.0002	< 0.002	< 0.01	140	5.0	24.5	< 2.0	4	19
07-Nov-85	20028	M-2	12.5	7.5	1580	0.03 <	0.01	0.020	275	0.021 <	0.10	< 0.005	< 0.05	< 0.10	< 0.0002	< 0.002	0.02	298	8.2	29.0	< 0.05	5,5,6,5	21,23,19,24
25-Feb-86	20521	M-2	11.7	7.3	1400	0.82	2.10	0.825	300	0.024	0.14	< 0.005	< 0.05	< 0.10	< 0.0002	0.013	< 0.01	240	NA	30.0	< 0.05	5	44
10-Apr-86	20735	M-2	11.5	7.3	1500	0.35	2.98	0.200	406	NA	NA	< 0.005	< 0.01	< 0.03	NA	NA	NA	229	NA	31.0	NA	NA	NA
29-Dec-86	21793	M-2	11.9	7.4	1600	0.10	0.25	0.070	320	0.019	NA	0.005	< 0.05	< 0.01	NA	< 0.002	0.01	100	8.8	28.0	< 5	5	38
27-Mar-87	22072	M-2	11.5	7.6	1250 <	0.03	0.03 <	0.010	290	0.027	NA	0.006	< 0.05	< 0.01	NA	< 0.002	< 0.01	169	7.0	27.4	< 5	4	26
30-Jun-87	22448	M-2	NA	7.5	1750	0.10	0.06	0.050	220	0.023	NA	< 0.010	< 0.05	< 0.01	NA	0.004	0.01	100	8.0	26.9	< 5	80	38
28-Sep-87	22901	M-2	11.9	7.5	1600	0.33	0.01 <	0.010	260	0.023 <	0.10	< 0.010	< 0.05	< 0.01 <	0.0002	< 0.002	< 0.01	230	17.5	27.3	< 2.0	4	22
07-Nov-85	20029	M-3	13.0	7.4	1780	1.52	0.42	0.173	430	0.006	0.10	< 0.005	< 0.05	< 0.10	< 0.0002	< 0.002	< 0.01	233	5.0	23.0	< 0.05	5,5,4,5	20,16,15,18
25-Feb-86	20522	M-3	12.3	7.5	1600	2.89	0.36	0.234	326	0.026	0.33	< 0.005	< 0.05	< 0.10	< 0.0002	0.007	< 0.01	183	NA	27.0	< 0.05	5	< 15
10-Apr-86	20736	M-3	11.4	7.3	1500	4.28	0.34	0.270	540	NA	NA	< 0.005	< 0.01	< 0.03	NA	NA	NA	178	NA	27.0	NA	NA	NA
29-Dec-86	21794	M-3	12.3	7.2	1900	1.80	0.25	0.160	520	0.031	NA	0.006	< 0.05	< 0.01	NA	< 0.002	0.04	90	6.6	26.0	< 5	4	23
27-Mar-87	22073	M-3	11.5	7.3	1650	1.81	0.32 <	0.010	500	0.015	NA	0.007	< 0.05	< 0.01	NA	< 0.002	< 0.01	135	8.2	26.3	< 5	4	16
30-Jun-87	22449	M-3	NA	7.4	2000	1.60	0.30	1.400	430	0.015	NA	< 0.010	< 0.05	< 0.01	NA	< 0.002	< 0.01	70	8.8	27.7	< 5	71	28
28-Sep-87	22902	M-3	11.9	7.5	1800	4.00	0.34	0.150	440	0.013 <	0.10	< 0.010	< 0.05	< 0.01 <	0.0002	< 0.002	< 0.01	180	7.2	27.7	< 2.0	4	16
07-Nov-85	20030	M-4	13.0	6.7	3600	2.75	3.90	0.464	2000 <	0.002	0.20	< 0.005	< 0.05	< 0.10	< 0.0002	< 0.002	0.02	430	4.1	140.0	< 0.05	6,6,6,6	33,41,35,37
25-Feb-86	20523	M-4	12.0	6.9	5450	7.50	4.80	0.659	1830	0.003	0.62	0.005	< 0.05	< 0.10	< 0.0002	0.005	< 0.01	348	NA	115.0	< 0.05	6	26
10-Apr-86	20737	M-4	11.5	6.8	4800	8.30	4.20	0.730	1630	NA	NA	< 0.005	0.03	< 0.03	NA	NA	NA	320	NA	92.0	0.06	5	< 100
29-Dec-86	21795	M-4	11.9	6.8	5350	4.70	3.60	0.780	2400	0.020	NA	0.012	< 0.05	0.01	NA	< 0.002	0.02	200	5.0	88.0	< 5	5	21
27-Mar-87	22074	M-4	11.1	6.9	4450	5.40	3.80	0.660	2100 <	0.002	NA	0.010	< 0.05	< 0.01	NA	< 0.002	< 0.01	180	8.3	82.1	< 5	5	39
30-Jun-87	22450	M-4	NA	6.8	6100	9.00	4.10	0.840	2200 <	0.002	NA	< 0.010	< 0.05	< 0.01	NA	< 0.002	< 0.01	130	12.0	83.3	14	137	42
28-Sep-87	22903	M-4	12.7	6.8	7100	10.70	4.10	0.460	2700 <	0.002 <	0.10	< 0.010	< 0.05	< 0.01 <	0.0002	< 0.002	< 0.01	290	19.0	84.0	3.0	6	39
07-Nov-85	20031	M-5	13.5	7.4	1250	0.27	0.04	0.712	80	0.026	0.10	< 0.005	0.05	< 0.10	< 0.0002	< 0.002	0.02	203	2.8	37.0	< 0.05	4,4,4,4	15,17,17,20
25-Feb-86	20524	M-5	11.8	7.5	1000	0.60	0.10	0.970	30	0.018	0.18	0.005	< 0.05	< 0.10	< 0.0002	< 0.002	< 0.01	176	NA	33.0	< 0.05	4	< 20
10-Apr-86	20738	M-5	11.0	7.4	900	0.08	0.10	0.040	150	NA	NA	< 0.005	< 0.01	< 0.03	NA	NA	NA	172	NA	32.0	0.13	3	< 100
29-Dec-86	21796	M-5	12.7	7.4	1050 <	0.10	0.21	0.050	120	0.020	NA	< 0.005	< 0.05	< 0.01	NA	< 0.002	< 0.01	122	4.4	24.0	< 5	3	20
27-Mar-87	22075	M-5	11.2	7.5	1000 <	0.03	0.02 <	0.010	100	0.020	NA	< 0.005	< 0.05	< 0.01	NA	< 0.002	0.02	113	4.7	22.8	< 5	3	24
30-Jun-87	22451	M-5	NA	7.6	1250	2.00	0.06	83.000	60	0.017	NA	< 0.010	< 0.05	< 0.01	NA	0.004	0.02	134	7.4	22.7	< 5	69	21
28-Sep-87	22904	M-5	12.9	7.4	1050	0.45	0.02 <	0.010	136	0.017 <	0.10	< 0.010	< 0.05	< 0.01 <	0.0002	< 0.002	< 0.01	150	7.9	26.2	95	3	28

TABLE 6

LOCKWOOD

DATE SAMPLED	LABORATORY DESIGNATION	FIELD STATION	WATER TEMP (C) (fld)	pH (fld)	SPEC. COND. (um/cm) (fld)	TOTAL IRON (mg/l)	TOTAL MANG. (mg/l)	TOTAL ZINC (mg/l)	SULF (mg/l)	TOTAL ARSEN (mg/l)	TOTAL BAR (mg/l)	TOTAL CAD (mg/l)	TOTAL CHRO (mg/l)	TOTAL LEAD (mg/l)	TOTAL MERC (mg/l)	TOTAL SELEN (mg/l)	TOTAL SILVER (mg/l)	TOTAL SODIUM (mg/l)	NITRATE-NITROGEN (mg/l)	CHLORIDE (mg/l)	PHENOLICS (ug/l)	TOTAL ORGANIC CARBON (mg/l)	TOTAL ORGANIC HALOGEN (ug/l as Cl)
07-Nov-85	20032	M-6	13.0	7.5	1530	0.50	0.34	0.050	275	0.019	0.10	< 0.005	< 0.05	< 0.10	< 0.0002	< 0.002	< 0.01	275	8.4	27.0	< 0.05	4,5,4,4	38,20,20,23
25-Feb-86	20525	M-6	12.3	7.5	1200	1.00	0.14	0.067	268	0.028	0.16	< 0.005	< 0.05	< 0.10	< 0.0002	0.006	< 0.01	214	NA	27.0	< 0.05	5	< 20
10-Apr-86	20739	M-6	11.7	7.5	1300	0.70	0.13	0.050	332	NA	NA	< 0.005	< 0.01	0.03	NA	NA	NA	220	NA	27.0	NA	NA	NA
29-Dec-86	21797	M-6	12.4	7.4	1400	0.10	0.15	0.040	280	0.022	NA	0.005	< 0.05	< 0.01	NA	< 0.002	0.01	90	7.8	28.0	< 5	4	20
27-Mar-87	22076	M-6	11.6	7.4	1250	0.38	0.14	0.030	260	0.022	NA	< 0.005	< 0.05	< 0.01	NA	< 0.002	0.03	155	6.0	27.9	< 5	4	27
30-Jun-87	22452	M-6	NA	7.6	1700	0.31	0.12	0.030	60	0.018	NA	< 0.010	< 0.05	< 0.01	NA	0.003	< 0.01	90	8.0	27.1	5	10	34
28-Sep-87	22905	M-6	11.9	7.5	1400	0.43	0.16	< 0.010	260	0.017	< 0.10	< 0.010	< 0.05	< 0.01	< 0.0002	< 0.002	< 0.01	200	12.5	28.0	8.0	4	19
07-Nov-85	20033	M-7	13.0	7.5	1460	0.22	< 0.01	0.020	120	0.023	0.10	< 0.005	< 0.05	< 0.10	< 0.0002	< 0.002	< 0.01	258	5.4	29.0	< 0.05	4,4,4,5	32,25,22,21
25-Feb-86	20526	M-7	12.4	7.4	1150	0.52	0.06	0.400	100	0.18	0.18	< 0.005	< 0.05	< 0.10	< 0.0002	0.004	0.03	166	NA	26.0	< 0.05	5	< 20
10-Apr-86	20740	M-7	12.2	7.4	1300	0.14	0.01	0.040	306	NA	NA	< 0.005	< 0.01	< 0.03	NA	NA	NA	217	NA	30.0	NA	NA	NA
29-Dec-86	21798	M-7	12.1	7.5	1200	< 0.10	0.08	0.060	180	0.024	NA	< 0.005	< 0.05	0.01	NA	< 0.002	0.01	97	2.8	23.0	< 5	8	21
27-Mar-87	22077	M-7	12.1	7.5	1300	0.05	< 0.01	< 0.010	240	0.029	NA	< 0.005	< 0.05	< 0.01	NA	< 0.002	< 0.01	162	7.2	31.6	< 5	4	23
30-Jun-87	22453	M-7	NA	7.6	1500	0.07	< 0.01	0.900	260	0.024	NA	< 0.010	< 0.05	< 0.01	NA	< 0.002	< 0.01	100	8.0	31.8	5	25	28
28-Sep-87	22906	M-7	12.2	7.6	1400	0.10	< 0.01	< 0.010	240	0.022	< 0.10	< 0.010	< 0.05	< 0.01	< 0.0002	< 0.002	< 0.01	210	14.5	32.2	< 2.0	4	27
07-Nov-85	20034	M-8	13.5	7.7	1410	0.73	0.02	0.049	120	0.021	0.10	< 0.005	< 0.05	< 0.10	< 0.0002	< 0.002	0.05	230	4.1	19.0	< 0.05	4,4,4,4	21,22,24,20
25-Feb-86	20527	M-8	12.3	7.5	1100	0.39	0.02	0.217	164	0.20	0.18	< 0.005	< 0.05	< 0.10	< 0.0002	0.004	0.01	176	NA	24.0	< 0.05	4	< 20
10-Apr-86	20741	M-8	11.5	7.5	1100	0.16	0.02	0.050	320	NA	NA	< 0.005	< 0.01	< 0.03	NA	NA	NA	207	NA	27.0	< 0.05	4	< 50
29-Dec-86	21799	M-8	12.6	7.4	1400	< 0.10	0.03	0.020	260	0.024	NA	0.006	< 0.05	< 0.01	NA	< 0.002	0.01	110	7.3	34.0	< 5	4	19
27-Mar-87	22078	M-8	11.9	7.5	1150	0.03	0.01	0.030	220	0.026	NA	< 0.005	< 0.05	< 0.01	NA	< 0.002	< 0.01	169	10.0	30.2	< 5	4	24
30-Jun-87	22454	M-8	NA	7.5	1650	0.12	< 0.01	0.100	220	0.021	NA	< 0.010	< 0.05	< 0.01	NA	0.003	< 0.01	80	10.0	30.1	6	16	36
28-Sep-87	22907	M-8	12.0	7.4	1400	0.17	< 0.01	< 0.010	260	0.020	< 0.10	< 0.010	< 0.05	< 0.01	< 0.0002	< 0.002	< 0.01	200	15.5	32.7	< 2.0	4	26

TABLE 6 (cont.)

DATE SAMPLED	FIELD STATION	pH (fld)	SPEC. COND. (fld)	TOTAL ORGANIC CARBON (mg/l)	TOTAL ORGANIC HALOGEN (ug/l as CL)	CHLORIDE (mg/l)	TOTAL IRON (mg/l)	TOTAL MANGANESE (mg/l)	PHENOLS (ug/l)	TOTAL SODIUM (mg/l)	SULFATE (mg/l)
85/11/07	M-3	7.4	1780	4.8	17	23.0	1.52	0.42	< 0.05	233	430
86/02/25	M-3	7.5	1600	5.0	15	27.0	2.89	0.36	< 0.05	183	326
86/04/10	M-3	7.2	1500			27.0	4.29	0.34		178	540
86/12/29	M-3	7.2	1900	4.0	23	26.0	1.80	0.25	< 5.00	90	520
87/03/27	M-3	7.3	1650	4.0	16	26.3	1.81	0.32	< 5.00	135	500
87/06/30	M-3	7.4	2000		28	27.7	1.60	0.30	< 5.00	70	430
87/09/28	M-3	7.5	1300	4.0	16	27.7	4.00	0.34	< 2.00	180	140
AVERAGE:	M-3	7.4	1747	4.4	19	26.4	2.56	0.33	2.85	153	455
88/03/30	M-3a	7.4	1600	5.0	16	---	---	---	---	---	---
88/03/30	M-3b	7.4	1600	5.0	15	---	---	---	---	---	---
88/03/30	M-3c	7.4	1600	5.0	16	---	---	---	---	---	---
88/03/30	M-3d	7.4	1600	5.0	16	---	---	---	---	---	---
88/09/29	M-3	7.4	1600	10.0	10	32.0	2.20	0.30	< 5.00	144	310
85/11/07	M-4	6.7	3500	6.0	37	140.0	2.75	3.90	< 0.05	430	2000
86/02/25	M-4	6.9	5450	6.0	26	115.0	7.50	4.80	< 0.05	348	1830
86/04/10	M-4	6.8	4800	5.0		92.0	8.30	4.20	0.06	320	1630
86/12/29	M-4	6.8	5350	5.0	21	88.0	4.70	3.60	< 5.00	200	2400
87/03/27	M-4	6.9	4450	5.0	39	82.1	5.40	3.80	< 5.00	180	2100
87/06/30	M-4	6.8	6100		42	83.3	9.00	4.10	14.00	130	2200
87/09/28	M-4	6.8	7100	6.0	39	84.0	10.70	4.10	3.00	290	2700
AVERAGE:	M-4	6.8	5264	5.5	34	97.8	6.91	4.07	3.88	271	2123
88/03/30	M-4a	6.8	6200	6.0	24	---	---	---	---	---	---
88/03/30	M-4b	6.8	6300	6.0	23	---	---	---	---	---	---
88/03/30	M-4c	6.8	6300	6.0	21	---	---	---	---	---	---
88/03/30	M-4d	6.8	6300	6.0	18	---	---	---	---	---	---
88/09/29	M-4	6.9	3400	14.5	15	43.0	0.80	1.69	< 5.00	209	1000
85/11/07	M-6	7.5	1530	4.3	25	27.0	0.50	0.34	< 0.05	275	275
86/02/25	M-6	7.5	1200	5.0	20	27.0	1.00	0.14	< 0.05	214	268
86/04/10	M-6	7.5	1200			27.0	0.70	0.13		220	332
86/12/29	M-6	7.4	1400	4.0	20	28.0	0.10	0.15	< 5.00	90	280
87/03/27	M-6	7.4	1250	4.0	27	27.9	0.28	0.14	< 5.00	155	260
87/06/30	M-6	7.6	1700		34	27.1	0.31	0.12	5.00	90	60
87/09/28	M-6	7.5	1400	4.0	19	28.0	0.42	0.16	8.00	200	260
AVERAGE:	M-6	7.5	1397	4.3	24	27.4	0.49	0.17	3.85	178	248
88/03/30	M-6a	7.7	1300	5.0	19	---	---	---	---	---	---
88/03/30	M-6b	7.7	1300	5.0	18	---	---	---	---	---	---
88/03/30	M-6c	7.7	1300	5.0	18	---	---	---	---	---	---
88/03/30	M-6d	7.7	1300	5.0	15	---	---	---	---	---	---
88/09/29	M-6	7.5	1400	10.9	30	29.0	0.40	0.17	15.00	141	190

TABLE 7

Lock[illegible] Corporation Groundwater Monitor Wells
(Background Calculations)

DATE SAMPLED	FIELD STATION	pH (fld)	SPEC. COND. (fld)	TOTAL ORGANIC CARBON (mg/l)	TOTAL ORGANIC HALOGEN (ug/l as CL)	CHLORIDE (mg/l)	TOTAL IRON (mg/l)	TOTAL MANGANESE (mg/l)	PHENOLS (ug/l)	TOTAL SODIUM (mg/l)	SULFATE (mg/l)
85/11/07	M-7	7.5	1460	4.3	25	29.0	0.22	< 0.01	< 0.05	259	120
86/02/25	M-7	7.4	1150	5.0	20	26.0	0.52	0.05	< 0.05	166	100
86/04/10	M-7	7.4	1300			30.0	0.14	0.01		217	206
86/12/29	M-7	7.5	1200	8.0	21	23.0	< 0.10	0.08	< 5.00	97	180
87/03/27	M-7	7.5	1300	4.0	23	31.6	0.05	< 0.01	< 5.00	152	240
87/06/30	M-7	7.6	1500		29	31.8	0.07	< 0.01	5.00	100	250
87/09/28	M-7	7.6	1400	4.0	27	33.2	0.10	< 0.01	< 2.00	210	240
AVERAGE:	M-7	7.5	1330	5.1	24	29.1	0.17	0.03	2.85	172	207
88/03/30	M-7a	7.4	1600	4.0	21	---	---	---	---	---	---
88/03/30	M-7b	7.5	1600	4.0	18	---	---	---	---	---	---
88/03/30	M-7c	7.4	1600	4.0	17	---	---	---	---	---	---
88/03/30	M-7d	7.4	1600	4.0	19	---	---	---	---	---	---
88/09/29	M-7	7.3	1390	9.0	21	30.0	< 0.10	< 0.01	19.00	165	240

TABLE 7 (cont.)

i. Parameters establishing groundwater quality:
   chloride
   iron
   manganese
   phenols
   sodium
   sulfate

ii. Parameters used as indicators of groundwater contamination:
   pH
   specific conductance
   total organic carbon
   total organic halogen

b. Sampling Frequency

i. For each indicator parameter specified in (ii) above, four replicate measurements will be obtained for each sample. Background arithmetic mean and variance will be determined by pooling the replicate measurements.

ii. Samples will be collected annually for analysis of parameters listed under (i) above. Samples will be collected semi-annually for analysis of parameters listed under (ii) above.

iii. Samples will be taken from monitoring wells M-3, M-4, M-6 and M-7 only.

c. Sample Collection

To ensure that standard and consistent methods are used to collect representative samples, the HWST analytical plan begins with the sample collection process. Methods of sample identification, containment and preservation are in accordance with 40 CFR Part 136, Federal Register, October 26, 1984. All sample collection and field analytical procedures are documented in a hardback, bound field notebook. Sampling and preservation procedures are covered in Table 8.

d. Chain-of-Custody

Whenever samples are taken from the site, the sample collector follows strict chain-of-custody protocols and initiates a chain-of-custody document which will accompany the sample until its final disposal.

Chain-of-custody procedures are described in detail in SOP-6, shown on the following page.

Table 8

Parameter	Container	Preservative	Sample Volume	Maximum Holding Time	Method	Detection Limit
pH	Plastic		Field Determination		150.1*	Range 4.0-10.0
Specific Conductance	Plastic		Field Determination		120.1*	Range 0.1-20,000
T.O.C.	Glass, Amber teflon-lined cap	H_2SO_4 pH <2 cool to 4½C	1 liter	28 days	415.1*	5.0 mg/L
T.O.X.	Glass, amber teflon-lined cap	cool to 4½C	1 liter	7 days	506**	0.01 mg/L
Chloride	Plastic	cool to 4½C	1 liter	28 days	407A**	1 mg/L
Sulfate	Plastic	cool to 4½C	1 liter	28 days	375.4*	1 mg/L
Phenols	Glass	H_2SO_4 pH <2, cool to 4½C	1 liter	28 days	420.1*	1 mg/L
Iron (Fe) Sodium (Na) Manganese (Mn)	Plastic	HNO_3 pH <2	1 liter	6 months	236.1* 273.1* 243.1*	0.1 mg/L 1 mg/L 0.01 mg/L

* "Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79-20.

** Standard Methods for the Examination of Water and Wastewater, 16th Ed., APHA-AWWA-WPCF.

S.O.P. 6 - CHAIN OF CUSTODY

PROCEDURES:

1. A chain-of-custody record will be initiated by the collector of the samples. The collector will record the date and time of collection, the location, the type and number of each sample, the analyses and preservation status of each sample, and the number of containers. He will assign a unique number to each sample, and affix to the sample an indelibly marked label identifying the sample.

2. Each time the samples are transferred from the custody of one person to another, both persons will sign the custody record and the date and time of transfer will be recorded. By his signature the sample custodian attests that he has inspected the sample containers and documents, has identified each sample by its unique number, and has assured himself of each sample's integrity at the time custody was transferred to him.

3. If the samples must be shipped to the laboratory, then the sample containers will be sealed with evidence tape. The shipping container will also be sealed or locked and the chain-of-custody record will accompany the shipment. Samples requiring preservation by cooling will include a High/Low thermometer in the shipping container.

4. Upon receiving samples in the laboratory, the sample custodian will accept custody of the samples, inspecting them as specified in 2, assign laboratory numbers and log the samples in, and store them in a locked sample refrigerator.

5. The sample custodian will transfer the samples to the laboratory personnel responsible for the analysis. Each analyst receiving a sample will inspect the sample for integrity and sign the custody record. He must be able to testify in court, if necessary, that from the moment of receipt until the final analysis the sample was in his view and possession, secured in locked storage, or sealed with evidence tape.

6. The custody of unused portions of the sample will be transferred back to the sample custodian, who will maintain them in secure, locked storage until instructed by the laboratory manager to discard them or return them to the client.

7. If at any transfer of custody a breach of the integrity of a sample is discovered, the laboratory supervisor will be notified immediately. He will then take appropriate action.

8. Chain-of-custody records for each project will be retained by the laboratory supervisor, filed by date or project name in a secure storage area.

e. Sample Transport

Samples collected by personnel are field preserved and returned to the laboratory for analysis as soon as possible via UPS. Laboratory personnel are notified in advance if the sample requires special treatment or immediate analysis. Sampling personnel ensure that the samples are properly labeled, preserved, and protected from breakage or tampering enroute. All samples are accompanied by a chain-of-custody document, and the sample containers and shipping container are sealed with custody tape.

f. Sample Receiving and Disposal

Upon arrival, all samples are inspected by the receiving agent for evidence of breakage, tampering, contamination or leakage. Sample labels are double-checked against sample analysis request sheets and chain-of-custody documents. Sample preservation is checked for conformance to 40 CFR Part 136 specifications, or to the special requirements of the analytical method. If necessary, samples are split and preserved. Only after all discrepancies have been resolved and documented is the sample logged into the Sample Logbook and given a sequentially assigned laboratory number.

If the sample is not analyzed immediately it is placed in sample storage appropriate to the sample matrix and analyses of interest. Ample locked, secure storage at 4 degrees centigrade is available for chain-of-custody samples. Maximum holding times are in accordance with USEPA regulations or as specified in the analytical method. If the holding time of an analyte is exceeded before the analysis is completed, the client is notified by the Laboratory Manager and a note included on the final report. The essential steps of the sample receiving process are documented by the receiving agent. Samples are typically held in storage for thirty days after issuance of the report to allow the client to request additional analyses.

g. Test Methods and Procedures

The HWST QA/QC program ensures that analysts are trained, evaluated and authorized by the laboratory manager to use the methods noted. Copies of these methods are kept readily available for subsequent reference by the analyst.

h. Data Reduction, Verification and Reporting

It is the responsibility of the analyst to record during an analysis any information necessary to reconstruct and verify the analytical procedure. This information is permanently recorded in a hardback, bound notebook issued to each analyst. In addition, bench sheets, computer or instrument printouts, chromatograms, and other ancillary data is clearly identified and permanently stored.

Data reduction is accomplished either by hand calculation clearly set up as a formula in the laboratory notebook, or by computer. Results are computed, tabulated in the laboratory notebook, and transcribed

onto a computer generated worksheet. The laboratory manner double checks this worksheet against the analyst's notebook and any ancillary data before passing the worksheet on for report processing. He also determines that the associated quality control data were sufficient and in control. If any discrepancies appear in the analysis, calculations, quality control or transcription, the results are held until the discrepancies are resolved or the analysis repeated to the satisfaction of the laboratory manager. As a final measure, the laboratory manager checks the final report for accuracy, reasonableness, and consistency among parameters before signing it and issuing it to the client.

i. Diagnostic and Corrective Actions

The precision and accuracy of all measurements are routinely monitored by the inclusion of quality control samples which are analyzed and statistically evaluated.

1. At least one in ten samples analyzed for any parameter is a duplicate sample. The precision of the measuring process is evaluated by comparing the relative standard deviation of duplicate measurements. Control limits are established at þ 10% RSD; results showing deviations greater than 10% RSD are considered out of control and require that all samples analyzed for that parameter since the last acceptable QC result be reanalyzed.

2. At least one in ten samples analyzed for any parameter is a quality control sample evaluated for accuracy. This may be any one or more of the following:

   i. A matrix-spiked sample. A background split from the sample is analyzed simultaneously with another split which has been spiked with a known quantity of the analyte of interest. The percent recovery of the added spike is calculated by comparison of the background with the spiked sample. Control limits are set at 90%-110% recovery. Spike recoveries outside of these limits require repeating the analysis until recovery is in control, or use of the method of standard additions to account for matrix affects.

   ii. A spiked blank. An aliquot of reagent grade water is spiked with a known quantity of the analyte of interest and analyzed. The percent recovery of the analyte must be within the control limits of 90%-110% or the analysis repeated.

   iii. A known, independently verified check sample. The sample is analyzed and the result compared to the true value. Control limits are set at þ three standard deviations from the true value. Results outside of these limits require repetition of all analyses performed for that analyte since the last acceptable QC result.

3. When new lots of reagents or solvents are used, or as required by the analytical method, reagent blanks are analyzed to demonstrate freedom from contamination by reagents, glassware or poor analytical technique.

4. These quality control measures are in addition to quality control samples taken as a check on sample collection and transport procedures.

5. These are the laboratory's minimum quality control measures used to routinely monitor the accuracy and precision of analytical procedures; if written methods demand a higher frequency of quality control samples or more stringent measures, the laboratory will follow the requirements of the method.

6. Any failure to meet the established criteria for a quality control measurement is viewed as a warning that the measurement is out of control. Further analysis and reporting of data is stopped, the laboratory manager is notified, and a written quality control irregularity report is initiated. After the problem has been identified and corrected, additional quality control samples are analyzed to ensure that the system is back in control before resuming analysis. All samples analyzed after the last acceptable quality control result are reanalyzed. A file of quality control irregularity reports and corrective actions taken is maintained by the laboratory manager.

7. Standard Operating Procedures 11 and 12 cover Diagnostic and Corrective Actions.

j. <u>External Performance Evaluations and Certifications</u>

In addition to a routine internal quality control program, HWST participates in a variety of programs conducted independently by outside sources. These serve as an additional check on the accuracy and precision of the laboratory's operations. They include performance evaluations based on the analysis of unknown samples, and performance audits leading to certification by independent authorities.

1. United States Environmental Protection Agency.

   i. National Pollutant Discharge Elimination System (NPDES) Program. An annual analysis of wastewater QC samples.

   ii. Water Supply Program. A biannual analysis of drinking water QC samples.

   iii. Water Pollution Program. A biannual analysis of water QC samples.

k. Data Evaluation

Evaluation of the data and owner/operator response will be done in accordance with 40 CFR Part 265.93. This analysis will determine if statistically significant increases (or decreases, in the case of pH) in concentration of water quality parameters have occurred. Statistical analysis of the analytical results of samples from monitoring wells M-3, M-4, M-6 and M-7 is shown on Table 9. These samples were taken on 3-30-88 and analyzed for Total Organic Carbon and Total Organic Halogen.

l. Security

The waste acid evaporation ponds have been enclosed in an 8-feet-high chain-link fence. The fence on the west and south sides are perimeter fences enclosing the entire Lockwood property. The north and east fences are new interior fences installed during closure operations. A locked access gate is located on the interior fence.

Access to the Lockwood property is limited to authorized personnel only. The perimeter fencing and the main building physically restricts access. The main entrance to the property is manned by a security guard 24 hours per day and locked during off hours. Two secondary entrances exist on the east side of the facility. The one is kept locked and the other is an access to a perimeter metal salvage yard only.

Signs with the legend "Closed Hazardous Waste Site-Keep Out" have been posted at each entrance to the closed waste-acid evaporation pond enclosure, in sufficient number to be seen from any approach. Signs are legible from a distance of 25 feet.

m. Exposure Information

Human exposure to hazardous waste or hazardous constituents may occur or be detected through a number of potential exposure pathways. Exposure routes may include air and dust inhalation, water ingestion, soil ingestion, dermal absorption, and ingestion of crops, livestock, or fish which have been exposed to a contaminant from the site. The following categories summarize these potential exposure pathways: groundwater, surface water, air (including subsurface gas), soil contamination, and food-chain contamination.

Primarily, the potential for human exposure at the facility is via the groundwater pathway as a result of leaching of metal contaminants to the underlying aquifer. Potential human exposure via groundwater can occur to persons served by a water supply system that draws contaminated groundwater as their water supply through ingestion and dermal exposure while bathing or showering. It could also occur where agricultural land is irrigated with contaminated groundwater and produce is contaminated and ingested. Humans may also be exposed via consumption of game animals that reside in such contaminated areas. In addition, surface waters may be contaminated by inflows of groundwater through bank seepage and springs. As with groundwater,

Lockwood Groundwater Monitoring Wells

(Statistical Analysis)

Field Station	Parameters	Average		Standard Deviation		Student's t-Test	
		* Recent	**Background	* Recent	** Background	t-Statistic	t .01
M-3	TOC	5.0	4.4	0	0.55	2.160	2.998
	TOX	15.8	19.2	0.50	5.19	1.288	2.896
M-4	TOC	6.0	5.5	0	0.55	1.789	2.896
	TOX	21.5	34.0	2.65	8.44	2.821	2.896
M-6	TOC	5.0	4.2	0	0.45	3.528	2.998
	TOX	17.5	24.2	1.73	5.78	2.204	2.896
M-7	TOC	4.0	5.0	0	1.73	1.139	2.998
	TOX	18.8	24.0	1.71	3.23	2.951	2.896

*Sampled 3-30-88
** Sampled 11-7-85
2-26-86
4-10-86
12-12-86
3-27-87
6-30-87
9-28-87

TABLE 9

potential human exposure via surface waters can occur to persons served by a water supply system that draws contaminated groundwater as their water supply through ingestion and dermal exposure while bathing or showering. Other potential human exposure to contaminated surface waters can occur through ingestion of contaminated fish, ingestion of contaminated produce as a result of agricultural and being irrigated with contaminated surface water, dermal and ingestion exposures through swimming and other water contact sports in such waters, and via consumption of game animals that reside in such contaminated areas.

From June to October 1984, a hydrogeologic investigation of the spent acid evaporation pond and surrounding area was performed to determine the extent and severity of groundwater contamination, if any, resulting from use of the pond. The hydrogeologic investigation consisted of a review of existing data, a field investigation under the direction of a hydrogeologist, and laboratory analyses of soil and groundwater samples (Hydrogeologic Investigation and Remedial Action Plan).

The investigation revealed that a leakage occurred in the north cell due to erosion of the clay liner near the influent discharge pipe. Consequently, the opening permitted rapid seepage through the pond bottom and into the underlying soils and groundwater.

The most significant pollutants are chromium and lead. Additional groundwater constituents have shown increases in concentration, including zinc, sulfate and iron. Chemical analysis of saturated sediment samples and groundwater samples provides evidence that the metals have precipitated out of solution and only a fraction remains mobile. The pollutant plume, however, is being naturally neutralized within a short distance by the alkaline nature of site soils and groundwater, thereby immobilizing the toxic metals. This conclusion is supported by the chemical analyses (Table 4 and Figures 3 and 4, Hydrogeologic Investigation and Remedial Action Plan). In addition, zinc and cadmium, although present at high concentrations in the pond sludges, precipitate out of infiltrating solutions in the alkaline soil and groundwater. Analysis of major aquifer parameters including Specific Conductance and pH and concentration of sulfates vs. distance (Figure 3, 4, and 5, Hydrogeologic Investigation and Remedial Action Plan) indicate that neutralization of the plume and/or maximum radial excursion does not exceed 300 feet to 400 feet from the point of seepage and with cessation of evaporation pond use, the release of pollutants has ended.

The use of groundwater in this area is restricted by the industrial nature of land use. The nearest well (a public supply well) is over 2,000 feet from the plume boundary and withdraws groundwater confined in the Brule aquifer. Samples taken from this well indicated no contamination (Section VI and Appendix III, Hydrogeologic Investigation and Remedial Action Plan). Groundwater flow is controlled by line sources of recharge and discharge which fluctuate with seasonal activities. Groundwater movement through the site is likely to alternate in direction.

In October 1985, eight monitoring wells and two monitoring/interceptor wells were constructed around the evaporation ponds (Figure 3). Groundwater samples from these wells have been tested regularly since installation (Table 6). Wells located hydraulically downgradient have been strategically located to monitor the pond for any unexpected contaminant migration, while wells located hydraulically upgradient and further from the pond, determine background quality. Two wells will be used as interceptor or recovery wells in the event monitoring reveals outward migration of contaminated groundwater thus enabling the owner to take corrective action before human exposure occurs.

Closure of the evaporation pond was performed in November, 1986. In general, the closure of the facility was completed in the following manner:

1. Pushing the exterior dikes into the center of the cells, thereby covering the contained sludge.
2. Placement of hydrated lime and soil layer.
3. Installation of impermeable synthetic liner.
4. Placing and compacting clay soil cover and gravel stabilizing layer.
5. Installation of security fence with proper signing.

For details on the closure of the facility, refer to the Closure Plan.

In addition, a Post Closure Plan for the facility was submitted to the NDEC in September, 1985. The Post Closure Plan identified the groundwater monitoring plan and maintenance activities to be carried out during the post closure care period. Annual and routine periodic inspections and associated maintenance of the facility final cover, security fencing/procedures used to limit public access to the facility, and a groundwater monitoring system will be conducted to ensure that each item remains functionally reliable throughout the post closure care period (Section I and Section II, Post Closure Plan).

In conclusion, the potential for human exposure and subsequent future exposure via the groundwater pathway will be minimized at the facility as a result of proper engineering/design/operating controls and procedures implemented through and further described in detail in the Closure and Post Closure Plans.

It should also be realized that other potential exposure pathways (described previously) could conceivably contribute to potential human exposure in addition to groundwater. The potential for human exposure via these pathways, however, are extremely remote and will have also been minimized at the facility through proper engineering/design/operating controls and procedures described above.

E. POST CLOSURE INSPECTION

The waste acid evaporation ponds in the southwest corner of the Lockwood property have been closed in accordance with 40 CFR 265. The Post Closure plan, that was prepared for the facility, recommends regular inspection and maintenance of the site. The items on the following page shall be checked monthly and maintenance activities undertaken as necessary.

The personnel responsible for conducting the inspection need to be trained as discussed in Part G of this document. The training is necessary to make the individuals aware of the potential hazards and liabilities which may be faced by Lockwood and their personnel if the structural integrity of the clay cover, fencing and monitoring wells were allowed to deteriorate.

POST CLOSURE INSPECTION SCHEDULE

LOCKWOOD CORPORATION

Date of Inspection_____

Inspector's Name_____

1. Walk perimeter of fence checking for loose posts, missing signs, holes in chain-link fabric, or other obvious damage.

   Satisfactory Condition

   Unsatisfactory Condition

   Maintenance or corrective action undertaken and date completed:

   _____

   _____

   _____

   _____

   Date_____ Responsible Party_____

2. Check security locks on access gates to site to assure they are functional.

   Satisfactory Condition

   Unsatisfactory Condition

   Maintenance or corrective action undertaken and date completed:

   _____

   _____

   _____

   _____

   Date_____ Responsible Party_____

3. Walk around and over entire site checking gravel surface and clay soil cover for wind or water erosion damage.

Satisfactory Condition

Unsatisfactory Condition

Maintenance or corrective action undertaken and date completed:

_____

_____

_____

_____

Date_____ Responsible Party_____

4. Check for evidence of ponding water on gravel surface and improper drainage away from site.

Satisfactory Condition

Unsatisfactory Condition

Maintenance or corrective action undertaken and date completed:

_____

_____

_____

_____

Date_____ Responsible Party_____

5. Check site for excessive weed growth and damage to clay cover by rodents.

Satisfactory Condition

Unsatisfactory Condition

Maintenance or corrective action undertaken and date completed:

_____

_____

_____

_____

Date_____ Responsible Party_____

6. Check all monitoring wells for damage to above ground extensions, caps and security locks on caps.

Satisfactory Condition

Unsatisfactory Condition

Maintenance or corrective action undertaken and date completed:

_____

_____

_____

_____

Date_____ Responsible Party_____

F. CERTIFICATION OF POST-CLOSURE CARE

Not later than 60 days after completion of the established post-closure care period for each hazardous waste disposal unit, Lockwood will submit to the Regional Administrator, by registered mail, a certification that the post-closure care period for the hazardous waste disposal unit was performed in accordance with the specifications in the approved post-closure plan. The certification will be signed by Lockwood and an independent registered professional engineer. Documentation supporting the independent registered professional engineer's certification will be furnished to the Regional Administrator upon request until he releases Lockwood from the financial assurance requirements for post-closure care under 40 CFR 264.145 (i).

G. FACILITY LOCATION INFORMATION

Information concerning the occurrence of floodplans and seismic activities at or near the location of the facilities is presented below.

1. 100-Year Floodplan

The Federal Insurance Administration has issued a Flood Hazard Boundary Map for the area where the Lockwood Facility is located. The map, a copy of which is included in Appendix C, indicates that the facilities in question fall outside any Flood Hazard areas.

2. Seismic Standard

The Hydrogeologic Investigation of 1984 included analysis of air photos by HWS staff Geologists within a radius of approximately one mile. No lineations suggesting the presence of faulting were observed. Field observations within a radius of about 1000 feet confirmed this conclusion.

Two experts on the geology of the region were consulted. Doctor Robert Goodwin (formerly of University of Nebraska Geology Department, now with HWS Technologies) and Doctor Hal DeGraw of the Conservation and Survey Division of the University of Nebraska (State Geological Survey) were asked their opinion of faults in the area. Both experts had no knowledge of faulting within several miles of the site. After a literature search, both experts reported that no author had documented faults in the area. Generally the region contains only a few faults.

Therefore, because of the scarcity of faulting in general in the region and the absence of known Holocene faulting, it can be concluded that the site complies with the Seismic standard.

H. PERSONNEL TRAINING

In order to assure that the closed site is adequately maintained during the post-closure period, a Training Guide has been prepared for use in training personnel responsible for site maintenance. A copy of the Training Guide is included, following this page.

LOCKWOOD TRAINING GUIDE
FOR POST-CLOSURE INSPECTION AND CARE OF CLOSED HAZARDOUS WASTE SITE

Location: The closed hazardous waste site (old spent acid evaporation pond) is located on the far South West corner of the South Lot of the existing facility along Highway 92 East in the Gering Industrial Park.

Security: The entire manufacturing complex is enclosed by a six foot high chain link fence and the close waste site is further contained on the inside perimeter by a like fence with locked gates. The facility is guarded by the company's 24 hour security team which has a security guard house located at the North East shop employee entrance gates.

Hazard: No chemical hazards currently exists at the closed waste site. The entire site was neutralized with soda ash and covered with dirt, a membrane liner, more dirt and a gravel cover per the Waste Site Closure Plan.

Responsible: Responsibility for inspection and care of the closed waste site is shared by the Area Manager of Plant II and the plant Maintenance Department.

The inspection of the closed waste site is performed on a monthly basis and includes completion of a simple check sheet, to verify acceptable completion of inspection and any required maintenance.

1) Examine and test locks on both the West and North gates to verify they are secure and functional.

2) Check gravel and clay surface covers for wind or water erosion or other damage. If damage exists contact maintenance for evaluation and repair. If necessary, a local contractor can be contracted to repair or replace the surface cover. Only light weight equipment or full tread equipment should be used to limit the potential from further damage to the cover.

3) Any evidence of ponding or improper drainage detrimental to the gravel or soil cover should be reported and corrected.

4) Excessive weed growth is not allowed and must be cut or removed to prevent heavy weed or plant root damage to the cover or security fence. Weeds can be cut with any light weight equipment, trimmers or pulled by hand. No heavy tired equipment, which would leave deep damaging tracks or get stuck in the cover can be used. The use of any herbicides for weed control would require preapproved by NDEC.

5) Check all monitoring and removal wells for damage to riser pipes, casing, caps in position, and functional locks. Report any problems for immediate corrective action by Maintenance.

6) Walk and examine perimeter fence for any sign of damage which requires repair. Maintenance is to be contacted for any problems.

Copies of the full Post-closure plan is available in the Regulatory Compliance Files. Contact the Plant Manager or Manufacturing Manager for access.

All required monitor well sampling must be scheduled and performed as required by the post closure plan and Nebraska Department of Environmental Control. Well samples are to be taken by Enviro-Service Inc. of Gering, or another approved lab and forwarded to an approved analytical lab for testing.

Copies of this training document are to be included in the Plant II safety and training book along with the full hazardous materials procedures. As with all certified and regulatory compliance training, the Personnel department will maintain records of this training including the individuals covered and assure annually that training and procedures are still in effect.

This Training Guide will be re-evaluated and updated, as conditions indicate, to keep the instructions current to regulatory requirements.

Distribution:

Becky Stitt	Personnel Manager
Bob Knoles	Plant II Area Manager

File: Post-Closure Plan

wp:letrdk01 disk 081

I. FINANCIAL CONSIDERATIONS

In accordance with the requirements of 40 CFR 264.144 and 264.145 the following information regarding Post-Closure Cost Estimates and Financial Assurance is presented.

1. Post-Closure Sampling, Testing, and Site Maintenance Costs

The estimated costs of collecting and analyzing groundwater samples from the existing monitoring wells and costs of inspecting and maintaining the closed site have been estimated and are as shown in Appendix D.

2. Financial Assurances

A Trust Agreement has been set up to assure that funds will be available for sampling, testing, and maintaining the closed site. A copy is included in Appendix E.

SECTION III. SOLID WASTE MANAGEMENT UNITS (SWMU)

This permit application, to this point, has addressed the Closure and Post-Closure activities pertaining to the Waste-Acid Evaporation Pond only. This section reviews all the Solid Waste Managements Units which have been identified in the Final RCRA Facility Assessment Report (RFA) for Lockwood, which was prepared for the EPA by Versar, Inc.

A. Waste-Acid Evaporation Pond

The bulk of this document has addressed the activities related to the waste-acid evaporation pond. It will not be discussed further in this section.

B. Waste Oil Storage Area

This storage area is located in the southeast corner of the property in a fenced area as shown on the topo Map attached as Appendix D. Primarily waste oils have been stored in this area in 55-gallon drums. In the past, some paint and solvent sludges were stored here, but now are stored in the hazardous waste storage area.

C. Raw Product Storage Area

This storage area is located west of the loading docks and south of the warehouse docks. Products stored here include paints, oils, lubricants, and chemicals. All are stored in drums, cans or tanks, with some sitting on the ground and some on concrete pads.

D. Scrap Metal Waste Bin Area

The waste bins are located east of the machine shop near the guard house at the west edge of the employee parking lot. The bins are used for disposal of scrap steel from fabrication processes and scrap metal chips from the machine shop. The bins are periodically emptied and disposed of off-site.

E. Hazardous Waste Storage Area

The site is located south of the galvanizing plant in a fenced area. It contains drums of paint wastes, paint sludges, solvent sludges, and waste acid effluent tank sludges. The drums are stored on pallets and are periodically transferred to a hazardous waste disposal site out of state.

F. Effluent Tank

This tank is located south and adjacent to the galvanizing plant. It is used to hold waste acid from the galvanizing plant and the chain plant prior to shipping to out of state hazardous waste disposal locations. The tank was constructed in 1984 to replace an older deteriating tank. It is constructed of concrete with double brick/liner layers. The asphalt, bricks, and mortar are all acid-resistant.

G. Solvent Recycling System

The solvent recycling is done in a small shed attached to the south side of the warehouse. It is used to recycle solvents used in the painting operations, including methyl-ethyl ketone, xylene, and toluene. The system is enclosed with the solvents recycled and the sludges placed in drums for storage at the hazardous waste storage area mentioned above.

The Final RCRA Facility Assessment Report discussed the evidence of spills or releases at some of the above SWMU's. Some sampling and testing of soils and water was done as part of the RFA. More sampling and testing may be necessary to confirm the presence or absence of contaminations at these sites. The results will dictate what remedial action, if any, may be necessary.

APPENDIX A

Hoskins • Western • Sonderegger, Inc.
P.O. Box 80358 825 J Street
Lincoln, Nebraska 68501
402/475-4241

December 17, 1984

Lockwood Corporation
P.O. Box 160
Gering, Nebraska 69341

ATTENTION: Mr. Roy Dugan

REFERENCE: Supplemental Report - Hydrogeologic Investigation and Remedial Action Plan Spent Acid Evaporation Pond

Dear Sir:

Soil samples from the evaporation pond sediments, the clay liner and the underlying alluvial soils have been analyzed for EP Toxicity, metals. Attached is exhibit I a summary of the analytic results. Figure 1 is a plot of the sampling locations including pond sites and auger boring locations.

Hydrogeologic investigation revealed the presence of chromium, lead and mercury in excursion from the pond. Excursion has occurred in a silty gravel aquifer beneath the ponds. Chemical analysis of saturated sediment samples and groundwater samples provides evidence that the metals have precipitated out of solution and only a fraction remains mobile. Methods of analysis include total metals in saturated sediments, EP Toxicity metals in saturated sediments and total metals in groundwater. The conditions of extractions for "totals" and EP Toxicity are rigorous and acidic. The natural hydrogeologic setting is alkaline. Our conclusions are that the naturally alkaline conditions at the site neutralize the acidic fluids within a short distance immobilizing the toxic metals. This conclusion is supported by the chemical analyses (Table 4, Hydrogeologic Investigation and Remedial Action Plan) and the diminishing concentrations of sulfates and the parameter, specific conductance in distance away from the evaporation ponds (Figures 3 and 4). Chromium concentrations decay at 0.1% to 0.3% per foot from the evaporation pond.

Our findings, based on evaluation of the EP Toxicity analysis of pond, liner and soil sediments are as follows:

1. The evaporation pond sediments, the clay liner and underlying soils are non-hazardous.

2. Mobil toxic metals in the groundwater are remnant of a single short term excursion resulting from erosion of the clay liner and subsequent leakage into the underlying aquifer.

3. Natural alkalinity is neutralizing the acid front and immobilizing the toxic metals.

4. With cessation of evaporation pond use the source of pollution has ended.

Based on these findings we reinterate the following recommendations:

1. Instigate closure of the evaporation ponds. Monitor the groundwater as recommended in the Hydrogeologic Investigation and Remedial Action Plan.

2. Encapsulate the abandoned ponds with a silty clay cover with positive, radial drainage.

3. We find no cause for removal of underlying soils and do not recommend treatment or removal.

If you have any questions concerning this letter or our recommendations, please contact myself or Mr. Brandt at your convenience.

Sincerely,

HOSKINS-WESTERN-SONDEREGGER, INC.

By_____
Roy W. Elliott
Hydrogeologist

RWE/vm
84/3936
Attachment
1 cc: Gary Brandt

TABLE I

SUMMARY OF EP TOXICITY ANALYSES
LOCKWOOD CORPORATION
SITE BORE HOLES

LAB I.D. No.		16801	16803	16804	16805	16806	16807	16818
Bore Hole I.D. (Depth, ft)		B1-A (9.0'-10.0')	B1-C (13.0'-14.0')	B1-D (15.5'-16.5')	B3-A (3.5'-4.0')	B3-B (10.5'-11.0')	B3-C (9.5'-20.0')	B5-D (10.0'-11.0')
Parameter	Unit	Concentration						
EP Toxicity Metals								
Arsenic	mg/l	<0.005	<0.055	<0.005	<0.005	<0.005	<0.005	<0.005
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Cadmium	mg/l	<0.005	<0.005	<0.005	0.010	0.030	0.040	<0.005
Chromium	mg/l	<0.05	<0.05	0.10	<0.05	0.07	0.05	<0.05
Lead	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mercury	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Silver	mg/l	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zinc	mg/l	0.05	1.5	1.7	120	230	1200	2.9

LAB I.D. No.		16830	16836	17078	17079	17080	17081	17082	RCRA MAX. CONTAMINANT LEVEL
Bore Hole I.D. (Depth, ft)		B7-C (10.0'-11.0')	B8-C (7.5'-8.5')	B-12 (7.5'-26.0')	B-13 (7.5'-25.9')	B-14 (8.1'-28.0')	B-15 (4.8'-22.5')	B-16 (7.0'-18.0')	
Parameter	Unit	Concentration							
EP Toxicity Metals									
Arsenic	mg/l	<0.005	<0.005	---------- Not Determined ----------					5.0
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	100.0
Cadmium	mg/l	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1.0
Chromium	mg/l	<0.05	<0.05	<0.05	<0.05	<0.13	0.05	0.14	5.0
Lead	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	5.0
Mercury	mg/l	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	0.2
Selenium	mg/l	<0.005	<0.005	<0.005	<0.005	<0.025	<0.005	<0.005	1.0
Silver	mg/l	0.1	0.1	---------- Not Determined ----------					5.0
Zinc	mg/l	2.3	0.19	0.05	0.04	0.05	0.03	0.04	------

TABLE II

SUMMARY OF SELECTED TOTAL METALS ANALYSES
LOCKWOOD CORPORATION
SITE BORE HOLES

LAB I.D. No.		Concentration 17078	17079	17080	17081	17082
Bore Hole I.D. (Depth, ft)		B-12 (7.5'-26.0')	B-13 (7.5'-25.9')	B-14 (8.1'-28.0')	B-15 (4.8'-22.5')	B-16 (7.0'-18.0')
Parameter	Unit					
Cadmium	mg/l	<0.005	0.007	<0.005	<0.005	<0.005
Chromium	mg/l	1.65	1.55	2.00	1.56	1.56
Chromium Hexavalent	mg/l	<0.05	0.12	0.15	<0.05	<0.05
Lead	mg/l	2.04	2.98	2.38	2.32	1.93
Mercury	mg/l	0.011	0.005	0.005	0.007	0.005

TABLE III

SUMMARY OF EP TOXICITY ANALYSES
LOCKWOOD CORPORATION
EVAPORATION PITS I & II

		Concentration Evaporation Pit I - Composites								Concentration Evaporation Pit II - Composites							
LAB I.D. No.		17005	17006	17007	17008	17009	17010	17011	17012	16793	16794	16795	16796	16797	16798	16799	RCRA MAX. PERMISSIBLE LIMITS
Parameter	Units																
Arsenic	mg/l	0.028	<0.005	0.024	0.006	0.015	0.041	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	5.0
Barium	mg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	100.0
Cadmium	mg/l	0.015	0.015	0.008	0.005	0.025	0.015	0.010	0.025	0.035	0.020	0.030	0.020	0.025	0.015	0.030	1.0
Chromium	mg/l	<0.05	<0.05	0.10	<0.05	<0.05	<0.05	<0.05	0.13	0.20	<0.05	<0.05	0.08	0.12	<0.05	0.12	5.0
Lead	mg/l	<0.1	<0.1	0.24	0.24	<0.1	<0.1	0.12	3.8	1.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.3	5.0
Mercury	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.12	<0.005	<0.005	<0.005	<0.005	0.2
Selenium	mg/l	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	1.0
Silver	mg/l	0.10	<0.1	<0.1	0.1	0.20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	5.0
Zinc	mg/l	150	200	124	100	350	210	150	310	970	660	980	520	930	340	1300	---

* Description of Lab I.D. Nos - See Attached Page 2

SUMMARY OF COMPOSITE SOURCES
LOCKWOOD EVAPORATION PIT #I

17005	17006	17007	17008	17009	17010	17011	17012
IA-1 (1'-2')	IA-15 (4'-5')	IB-1 (1'-2')	IB-15 (4'-5')	IC-1 (1'-2')	IC-15 (4'-5')	ID-1 (1'-2')	ID-15 (4'-5')
IA-2 (2'-3')	IA-5 (4'-5')	IB-2 (2'-3')	IB-4 (4'-5')	IC-2 (2'-3')	IC-4 (4'-5)	ID-2 (2'-3')	ID-4 (4'-5')
IA-3 (2'-3')		IB-3 (3'-4')	IB-5 (5'-6')	IC-3 (3'-4')	IC-5 (5'-6')	ID-3 (3'-4')	ID-5 (5'-6')
IA-4 (3'-4')		IB-11 (0'-1')		IC-11 (0'-1')		ID-11 (0'-1')	
IA-11 (0'-1')		IB-12 (1'-2')		IC-12 (1'-2')		ID-12 (1'-2')	
IA-12 (1'-2')		IB-13 (2'-3')		IC-13 (2'-3')		ID-13 (2'-3')	
IA-13 (2'-3')		IB-14 (3'-4')		IC-14 (3'-4')		ID-14 (3'-4')	
IA-14 (3'-4')							

LOCKWOOD EVAPORATION PIT #II

16793	16794	16795	16796	16797	16798	16799	16800
IIA-11 (0'-1')	IIA-15 (4'-5')	IIB-1 (0'-1')	IIB-5 (4'-5')	IIC-1 (0'-1')	IIC-5 (4'-5')	IID-1 (0'-1')	IID-5 (4'-5')
IIA-1 (0'-1')	IIA-5 (4'-5')	IIB-11 (0'-1')	IIB-15 (4'-5')	IIC-11 (0'-1')	IIC-15 (4'-5')	IID-11 (0'-1')	IID-15 (4'-5')
IIA-12 (1'-2')		IIB-2 (1'-2')		IIC-2 (1'-2')		IID-2 (1'-2')	
IIA-2 (1'-2')		IIB-12 (1'-2')		IIC-12 (1'-2')		IID-12 (1'-2')	
IIA-13 (2'-3')		IIB-3 (2'-3')		IIC-3 (2'-3')		IID-3 (2'-3')	
IIA-3 (2'-3')		IIB-13 (2'-3')		IIC-13 (2'-3')		IID-13 (2'-3')	
IIA-14 (3'-4')		IIB-4 (3'-4')		IIC-4 (3'-4')		IID-4 (3'-4')	
IIA-4 (3'-4')		IIB-14 (3'-4')		IIC-14 (3'-4')		IID-14 (3'-4')	

APPENDIX B

HYDROGEOLOGIC INVESTIGATION AND REMOVAL ACTION PLAN
SPENT ACID EVAPORATION POND
LOCKWOOD CORPORATION
GERING, NEBRASKA

OWNER:

Lockwood Corporation
P.O. Box 160
Gering, Nebraska 69341

PREPARED BY:

Hoskins-Western-Sonderegger, Inc.
825 "J" Street P.O. Box 80358
Lincoln, Nebraska 68508

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I. INTRODUCTION

Hoskins-Western-Sonderegger, Inc. performed a hydrogeologic investigation for the Lockwood Corporation, Gering, Nebraska from June to October, 1984. The investigation was in response to an Administrative Order (No. 756) from the Nebraska Department of Environmental Control (June 20, 1984) and involved a study of the Lockwood spent acid evaporation pond and surrounding area to determine the extent and severity of groundwater contamination, if any, resulting from use of the pond. Specifically, the study was to determine if hazardous concentrations of heavy metals had reached the aquifer and, if so, the nature of their movement and recommendations for remedial action or aquifer rehabilitation.

The Lockwood plant is located in the East ½ of the SE¼, Section 1, T21N, R55W in Scottsbluff County, Nebraska (see figure 1). The spent acid evaporation pond is located at the southwest corner of the plant property.

The hydrogeologic investigation consisted of a review of existing data; a field investigation under the direction of a hydrogeologist; and laboratory analyses of soil and groundwater samples. Included in this report are descriptions of the review of existing data and the field investigation procedures; laboratory analyses conducted; and summaries of evaluation procedures and results under the major headings of Geology, Hydrogeology, and Groundwater Quality. Conclusions and recommendations follow and are offered as a framework for future remedial action.

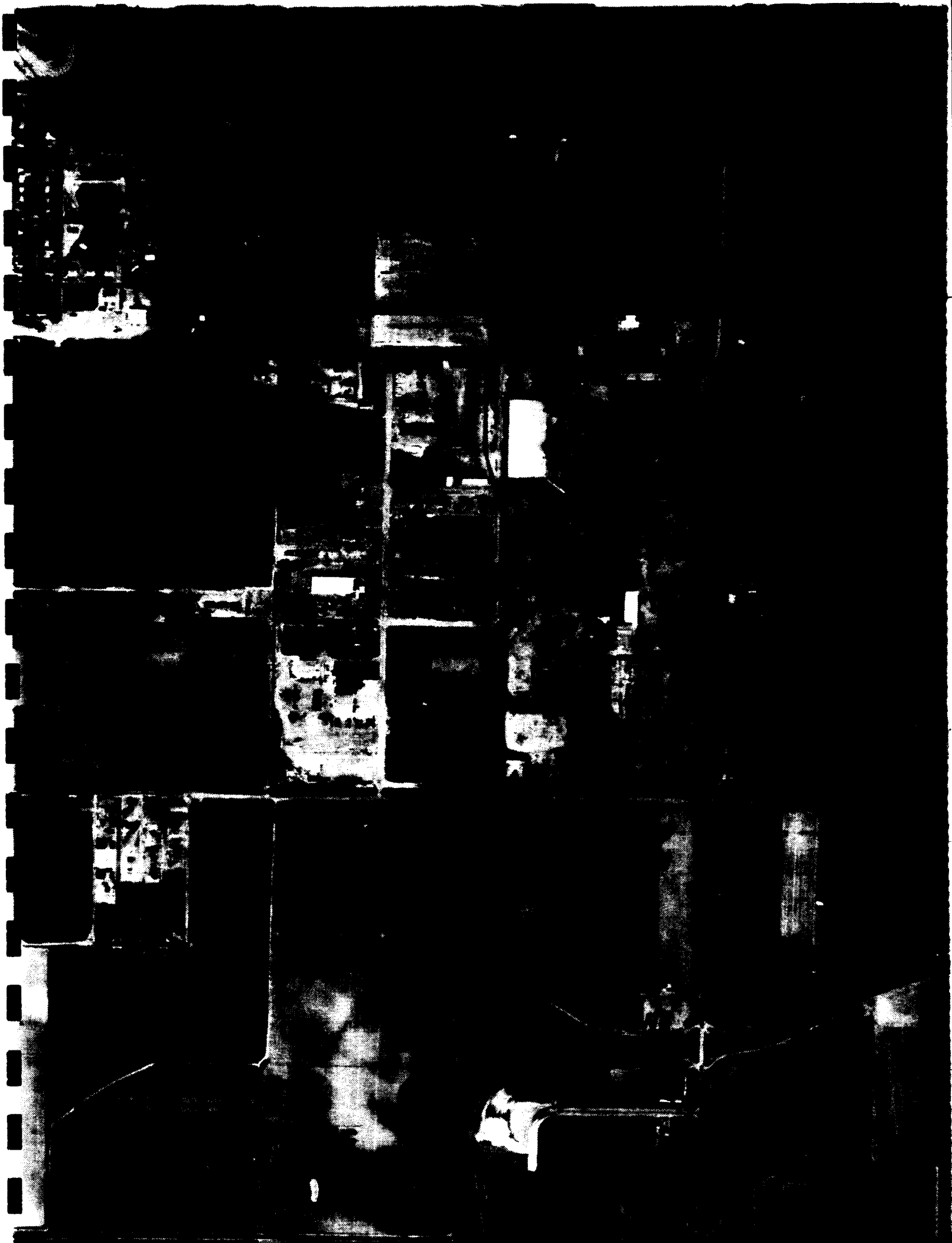


FIGURE 1
LOCATION OF SITE

II. CONCLUSIONS & RECOMMENDATIONS

Based on the data to date and the findings of this investigation, we conclude that the chromium/lead/sulfate pollutant plume is the result of a leakage episode initiated by erosion of an effective clay liner. The pollution plume, in at least the westerly and southerly directions, is being naturally neutralized by the alkaline nature of site soils and groundwater. We find the extent of pollution to not exceed 300 to 400 feet from the site and with cessation of evaporation pond use that the pollution has ended.

The use of groundwater in this area is restricted by the industrial nature of land use. The nearest public supply well is over 2,000 ft. from the plume boundary and withdraws groundwater confined in the Brule aquifer. Groundwater flow is controlled by line sources of recharge and discharge which fluctuate with seasonal activities. Groundwater movement through the site is likely to alternate in direction.

Our recommendations are as follows:

1. Instigate closure of the spent acid evaporation pond.
2. Remove the pond sediments and clay liner and dispose of in accordance with NDEC regulations.
3. Cover the site with a silty clay cap not less than 1.0 ft. thick and grade to drain away from the site.
4. Install four (4) groundwater monitoring wells fully penetrating to the top of the Brule formation. Sample these wells on a quarterly bases for a minimum of 1 year and test the samples for chromium, lead, sulfate and specific conductance. If at the end of four (4) quarters no increase in these constituents or parameters occurs, reduce monitoring to biannually for two additional years.

Locations for proposed monitoring wells are indicated on Sheet 1. Figure 6 is a general design for proposed monitoring wells.

5. If monitoring reveals continued outward migration of the polluted groundwater, the monitoring wells shall be used as interceptor wells and a pump test performed on each well by a hydrogeologist. All waters will be directed to the neutralization tank and treated for subsequent disposal.

III. METHODS OF INVESTIGATION

Preliminary data collection included a review of the regional geologic and hydrologic setting, readily available in maps and reports published by the state and U.S. geologic surveys. These included: U.S. Geological Survey Water Supply Paper 943; U.S.G.S. Professional Paper 550-D; Scottsbluff County Test Hole Report; Groundwater Maps (1980); and others.

Information on soil conditions is available in the Soil Survey of Scottsbluff County, a U.S.D.A. Soil Conservation Service publication. Black and white air photos of the area were taken in 1977 and are available at a 1:48,000 scale. Well registration records are available at the State Department of Water Resources and provide drilling logs and water level information. Water quality data are available at the U.S.G.S., the Conservation and Survey Division, and State Health Department. Historical and operational data regarding the spent acid evaporation pond and plant processes were available at Lockwood Corporation.

Field investigation included auger borings at the site according to ASTM Designation D 1452-65 (revised 1980) and sampling by split-barrel sampler according to ASTM Designation D 1586-67 (see Sheet 1). Elevation and location surveys of the boreholes were done. Groundwater sampling from the boreholes was by PVC bailer according to ASTM Designation D 3370. Samples of the various wastes entering the pit were collected. RCRA Chain of Custody requirements for all water and waste sampling were followed. Laboratory analyses of soil and water chemistry were done according to standard methods.

IV. GEOLOGY

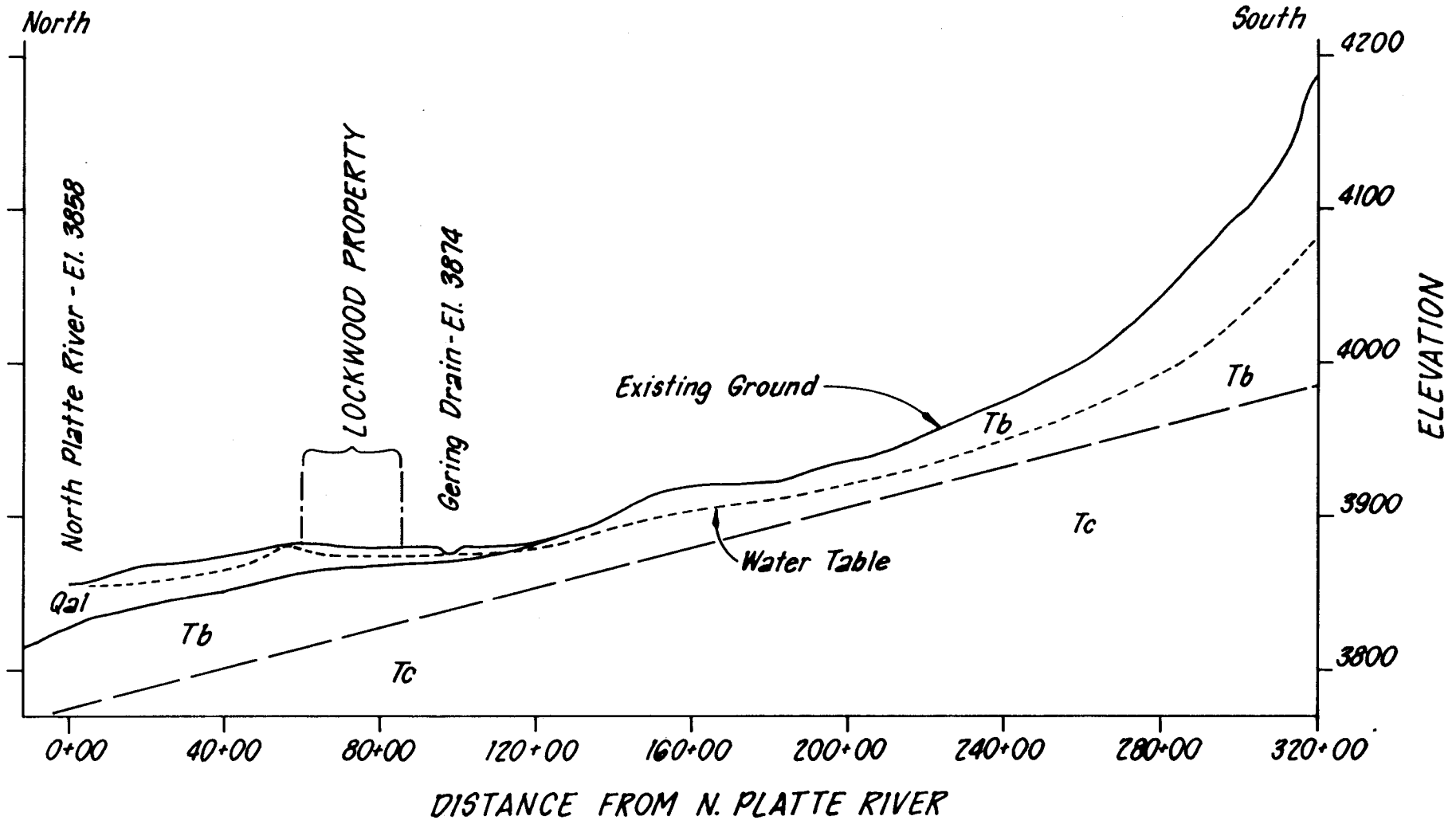
The city of Gering and the Lockwood plant site lie within the North Platte Valley in Scottsbluff County, Nebraska. This area is within the High Plains division of the Great Plains physiographic province. The North Platte Valley was formed from the dissection of the High Plains by the North Platte River and its tributaries. The river and its tributaries have eroded through more than 1,000 feet of tertiary-age sediments. The North Platte River flows from northwest to southeast through Scottsbluff County. The plant site is located approximately two miles south of the river. The river is locally flanked to the north and south by remnants of high terraces which form the valley walls. Some terraces are capped by a thin mantle of gravel which has protected them from erosion. The Lockwood site exists on the Quaternary alluvium (stream-deposited sediment) of the North Platte River's flood plain.

Generally, Cretaceous and Tertiary-age material form the High Plains and underlie this site. This material consists of semi-consolidated to consolidated gravel, sand, silt and clay which was deposited by rivers flowing from the Rocky Mountains. Five formations are representative of the High Plains of Scottsbluff County. The formations exposed in the county are (in ascending stratigraphic order) the Lance, Chadron, Brule, Gering and Arikaree. Not all of these formations were encountered during this investigation. The Gering and Arikaree formations form the upland plateaus and the bluffs and are not present at the site. The sandstone and clay of the Lance formation and the overlying Chadron siltstone are too deep to be of significance in this investigation. This work dealt with the erosional surface of the Brule formation and its thin mantle of

younger alluvial sediment. The Brule underlies the Lockwood site. Figure 2, modified from U.S.G.S. Water Supply Paper 943, summarizes the geology of the area. The Brule formation is a light-colored silt or siltstone, frequently massive in character (that is, not exhibiting bedding or layering). Much of the formation was deposited by ancient streams. Some channel sands occur within the siltstone and volcanic ash accumulated locally, possibly in bodies of standing or slow-moving water (pools in the stream or ponds). Part of the Brule probably consists of eolian (wind-blown) sediment. Grain-size analyses of parts of the Brule are similar in some respects to a loess, being fairly uniform and predominantly silt-sized. The Brule is calcareous, and some lime-cemented zones have greater resistance to weathering, erosion, and the transmission of water. While generally massive or finely laminated, the Brule may weather into a blocky or slabby structure, developing a secondary permeability. This accounts for its ability to transmit water in moderate to large amounts. These openings in the rock have in the past been attributed to fractures (Wenzel, Cady and Waite 1946) but are now thought to occur mainly as natural "piping" (Lowry, 1966). Piping is a process by which channels or conduits are opened by the action of moving water on rocks with limited cohesion.

The alluvium mantling the Brule formation consists of both coarse (sand and gravel) and fine (silt and clay) material. Distribution of the various sediments is complex and related in part to the energy and gradient of the stream, channel shape and source of sediment. While terrace fill and recent alluvium may exceed 200 feet in places along the North Platte Valley in the vicinity of Gering and the Lockwood plant these unconsolidated deposits mantling the Brule bedrock are generally 20 feet thick or less.

FIGURE 2 GEOLOGIC CROSS SECTION



V. HYDROGEOLOGY

Groundwater in the vicinity of Gering, Nebraska and the Lockwood Corporation occurs locally in surficial fill material, and generally in the shallow alluvium and the underlying weathered Brule formation. The sediments in the vicinity of the spent acid evaporation pond can be considered as three hydrogeologic units: (1) an upper unit of silty and sandy clay approximately 7 to 10 feet thick; (2) a sand and gravel unit 10 to 12 feet thick with some interbedded silty and sandy clays; and (3) a semi-consolidated silty clay constituting the weathered surface of the Brule formation. The Brule was encountered at depths of 19 to 25 feet. Groundwater in the alluvium (Unit 2) is unconfined (a "water table" setting) while the groundwater in the Brule is probably semiconfined to confined ("artesian" setting) with impermeable zones or beds within the Brule likely acting as confining beds. Depth to the water table is generally less than ten feet. Direction of regional groundwater flow in the alluvium is east-northeast toward the North Platte River, although locally flow directions are quite different in response to nearby canals, drains, lagoons, wells, and other sources of groundwater recharge or discharge. In the vicinity of the plant site, groundwater flows alternate between north and south, flowing respectively toward the North Platte or toward discharge into the Gering Drain (see Figure 2). This local flow system is believed to be due in part to recharge north of the plant property by an irrigation canal and alternatively to a local line source ditch during summer irrigation season. Sheet 1 shows water level elevations in boreholes near the spent acid evaporation ponds. Direction

of flow within the Brule formation may be different, owing to the different character of that unit and the possibility of secondary permeability (fractures, joints or erosional "piping" structures). Research of available literature and analysis of topographic maps indicates the Lockwood plant site was historically an area of natural groundwater discharge, probably consisting of seeps and marshy conditions for at least part of each typical year. This would cause salt or alkalai build-up in the soil and modify soil properties. The "scabby" nature of soil in the area was discussed in the County Soil Survey. This site was not suitable for agriculture. Plant records and soil sampling indicate fill was added prior to pond construction raising the site approximately 2 to 4 feet.

The capacity of a porous material to transmit a fluid is the permeability; the permeability of a material with respect to water is its hydraulic conductivity. Hydraulic conductivity can be estimated by visual inspection of the samples and can be determined in the laboratory. Table 1 summarizes hydraulic conductivity values determined during this investigation.

TABLE 1. AQUIFER PARAMETER OF SITE SOILS

Soil Designation (Unified Soils)	Soil Unit	Saturated Thickness, ft. (m)	Hydraulic Conductivities gpd/ft²	Transmissivities gpd/ft
Fill (SM)	N.A.	0	0.5 to 10	---
Sandy Clays (CL)	1	0 to 5	$5x10^{-5}$ to $5x10^{-2}$	insignificant
Silty Sands (SM)	1	5 to 15	1 to 30	5 to 450
Silty Gravels (GM)	2	5 to 10	5 to 50	25 to 500
Sand (SP)	2	0 to 8	50 to 100	0 to 800

The gradient of the water table across the site varies with the irrigation season. During this investigation there was a slight gradient to the north probably associated with line source recharge provided by a local drain canal parallel to the southern property boundary (Sheet 1). The constant recharge produces a groundwater mound. This mound decays in several days to several weeks after surface flow ceases. Groundwater in the alluvium during evaporation pond use, moved laterally beneath the site hydraulically outward in all directions.

The overall water-transmitting capability of the entire thickness of an aquifer is called the transmissivity (T). This term is defined as the rate of flow in gallons per day through a vertical section of aquifer with a width of one foot and a hydraulic gradient of one. Transmissivity is the product of hydraulic conductivity and thickness.

$$T = \Sigma Kb$$

For example, the maximum transmissivity of the alluvial aquifer at Boring B-1 is:

$$T = (8x2) + (30x4) + 50x7.5) = 511 \text{ gallons/day/foot}$$

Transmissivities of the alluvium in the vicinity of the acid pit range from approximately 300 gpd/ft to 600 gpd/ft.

Transmissivities of the Brule aquifer cannot be directly calculated since drilling did not penetrate any significant thickness of the formation. Estimation of the Brule transmissivity can be made, however, based on yields of wells drilled into the formation. Transmissivity is related to the specific capacity of a well (gallons per minute pumped per foot of drawdown in the well) by the equation

$T = 2000\ Q/S$, where Q/S is the well specific capacity.

Transmissivities of the local wells developed in the Brule formation range from 5,000 gpd/ft to 27,000 gpd/ft. Note that these wells penetrate deep into the formation. Large thicknesses of Brule are required to obtain the yield necessary for public supply and irrigation wells. This is an indication of the low permeability of this unit.

Considering the hydrogeology of the pit area in detail, the spent acid evaporation pond was preceded in use by an acid pit. The effectiveness of the pit in retaining acid and metal laden water is unknown. The existing pond was installed with a clay liner under design criteria develope by the U.S. Soils Conservation Service. The liner rests on fill and complex but generally fine-grained alluvium. Logs from borings B-1, B-2, B-3, B-7 and B-8 (the closest to the pits) indicate differing thicknesses and percentages of silt and clay in the upper few feet of sediment (see Appendix I). Samples collected at the new neutralization pit indicate silt and clay (sandy in part) to 6 feet, with clayey sand beginning at that depth. This would infer that (1) a degree of protection exists for the alluvial aquifer, as hydraulic conductivities are somewhat lower in the areas with higher silt and clay content; and (2) the complex distribution of the sandy zones could allow highly variable recharge rates; that is, more infiltrating "recharge" water would flow through some parts of the subsurface than others; and (3) because of these complexities, flow paths to the alluvial aquifer could be extended somewhat in length, with longer travel times resulting. In the saturated zone, the sand and gravel (Unit 2) would transmit water and contaminants more efficiently but the most permeable zones here would also be distributed unevenly. This concept of complex and lengthy flow paths has significance when water quality is considered, especially the cumulative interaction between contaminant and aquifer media.

VI. GROUNDWATER QUALITY

Quality of water in the alluvium and the Brule formation is similar but highly variable. Groundwater is generally a calcium bicarbonate to sodium bicarbonate type. Concentrations of sodium and potassium differ considerably from place to place. Groundwater is hard, although generally water from the Brule formation is somewhat less mineralized. Sulfate concentrations are elevated and approach the recommended drinking water limit (250 mg/l). Total Dissolved Solids values frequently exceed the 500 mg/l recommended drinking water limit. Table 2 gives water quality in selected county wells (Wenzel and others, 1946). Table 3 gives data from the Gering municipal wells (State Health Dept., 1982).

Groundwater samples were collected from the boreholes by bailing, preserved, and transported to Western Laboratories promptly for analysis. Laboratory analyses included the parameters; E.P. toxicity including cadmium, chromium, and zinc; mobile iron; and sulfate. Temperature, pH and specific conductance were measured in the field. Results of these analyses are summarized in Table 4.

Samples were also collected of the Lockwood acid and waste products at different points in the process. These data are not available at this time and will follow in a supplemental report.

Samples of the closest drinking water well, the City of Gering's Well 77-1, were collected. These data are shown in Appendix III and indicate no contamination of this well has occurred. Resampling of the well in August 1984 confirmed the absence of contamination. The pollutants of concern in the groundwater at Lockwood were determined to be Chromium and lead. Because of the high colloid content of water samples

from purged borings we chose to perform several tests on the water samples. The first test was for E.P. Toxicity metals (cadmium, chromium, lead) in the water sample. The second test was for the total metal (chromium, lead) occurring as precipitates attached to clay particles by sample digestion and subsequent analysis. Note in Table 4 that Hexavalent Chromium (Cr VI) was also separated from total chromium as an indication of the toxic fraction. In Table 4 all values except total chromium and Cr VI are mobile or in the groundwater solution.

TABLE 2. ANALYSES OF WATER FROM SOURCES IN SCOTTS BLUFF COUNTY, NEBRASKA, AND ADJACENT AREAS

[Well numbers correspond to numbers in table of well records, pp. 136–148. Parts per million.]

Wells in sand and gravel

Well No.	Owner or point of collection	Depth (feet)	Date of collection	Total dissolved solids	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulphate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Total hardness as $CaCO_3$	Analyst
———	City of Gering	80	Dec. 4, 1937	782			48	22	212		462	182	52	0.0	38	210	W. M. Noble.
———	City of Henry	80	Dec. 10, 1937	447			78	22	54		305	124	12	.8	5.9	285	Do.
———	Village of Lyman	50–80	Dec. 11, 1937	732			66	18	187		500	169	31	2.0	13	239	Do.
———	City of Minatare	60–90	Dec. 4, 1937	633			82	21	122		395	174	32	.5	7.2	291	Do.
———	City of Mitchell	83	Dec. 10, 1937	427			74	23	49		281	108	23	.8	11	279	Do.
———	City of Morrill	60	do	487			74	24	69		317	140	13	.6	10	283	Do.
———	City of Scottsbluff	100±	Dec. 3, 1937	545	28	0.04	89	20	70	4.6	340	130	24	.3	12	304	Do.
15	Frank Thomas	14.3	Dec. 11, 1937								456	410	75	3.3	8.2	345	W. M. Noble.
21	W. G. Parker	41.5	do								403	200	15	.5	1.4	315	Do.
24	Harvey Harward	29.3	do								383	230	15	1.1	8.8	303	Do.
49	Otto Juergens	50.6	Nov. 30, 1936	571			103	19	78		374	157	15	1.2	14	335	M. D. Foster.
98	B. J. Pieper	44.7	Dec. 15, 1937								383	200	17	.4	4.2	315	W. M. Noble.
127	George Emery	26.2	Dec. 14, 1937								369	230	28	1.9	15	126	Do.
195	Harry Pieper	49.6	Dec. 13, 1937	577			89	27	79		325	194	21	.9	6.0	333	Do.
282	Harry Long	36.8	Dec. 6, 1937								305	180	14	.0	8.0	300	Do.
292	Virgil Trout	59.6	Nov. 30, 1936	432			72	14	65		270	134	9	.6	4.8	237	E. W. Lohr.
409	Ollie Jones	[1] 110	Dec. 10, 1937								324	140	58	.3	120	162	Do.

Wells in the Brule formation

17	J. C. Grim	114.5	Dec. 11, 1937								291	30	30	0.6	25	58	W. M. Noble.
32	Mrs. Frank Moritz	140	do								192	80	11	.3	5.9	189	Do.
37	School District	76.8	do								259	180	11	.0	4.7	267	Do.
78	School land	77.4	Dec. 14, 1937								266	110	34	.1	6.9	188	Do.
88	F. G. Tanner Estate	34.2	do								423	200	29	.2	17	234	Do.
150	J. B. Schrock	48.7	Dec. 3, 1937								224	110	10	.3	4.7	195	Do.
168	S. A. Burkey	89.7	Dec. 2, 1937								240	22	10	.0	29	201	Do.
172	Mrs. Addie Lewis	62.9	Dec. 14, 1937								350	90	67	.9	25	74	Do.
209	Joe McCoy	68.1	Dec. 3, 1937								257	170	11	.0	8.8	237	Do.
259	F. E. McClanahan	17.6	Dec. 13, 1937								1,065	400	195	2.2	17	52	Do.
272	Andrew Oleson	142.3	Dec. 3, 1937								294	110	17	.6	20	44	Do.
275	Carl Thomas	63.6	do								262	170	13	.3	15	273	Do.
277	Ola Mitchell	66.6	do								263	150	11	.4	11	225	Do.
303	Mrs. D. L. Hawbaker	83.6	Dec. 6, 1937								226	16	5	.5	9	112	Do.

TABLE 3

Community	Sampled	pH	TS	Fe	Mn	F	Alk	Hard	Ca	NO_3	Cl	SO_4	Na
Gering													
53-3 (7)	7-76	7.8	824	0.0	0.0	0.30	368	272	86	6.4	66	201	135
58-1 (8)	7-76	7.3	744	0.0	0.0	0.25	340	256	94	0.8	34	230	97
58-2 (9)	7-76	7.6	592	0.0	0.0	0.26	264	264	88	1.4	20	203	68
58-3 (10)	7-76	7.6	718	0.0	0.0	0.28	320	276	91	4.5	44	195	96
61-1 (T1)	7-76	7.7	584	0.1	0.0	0.31	252	260	83	1.6	20	225	76
65-1 (T2)	7=76	7.7	608	0.0	0.0	0.28	272	272	88	1.6	24	206	75
65-2 (T3)	7-76	7.6	702	0.0	0.0	0.29	316	256	86	2.8	26	255	108
76-1	10-77	8.1	968	0.0	0.0	0.93	396	132	38	5.2	120	191	350

TABLE 4. WATER ANALYSIS FOR GROUNDWATER
(Specific Conductance in μmhos; pH in
all other parameters in mg/L, Sampling 2

BORING NO:	1	2	3	4	5	6	7	8	9	
Specific Conductance	1,200	NA	3,100	3,200	4,100	2,450	2,800	2,100	1,600	8,
pH	8.3	NA	8.7	8.6	8.4	8.5	8.6	8.5	8.2	7
Cadmium	<0.01	<0.01	NA	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0
Chromium	0.1	<0.05	NA	<0.05	<0.05	0.12	0.10	0.15	<0.05	<0
Total Cr	0.26	0.32	0.32	<0.05				NOT ASSESSED		
Cr VI**	NA						NOT ASSESSED			
Lead	NA						NOT ASSESSED			
Total Pb	NA						NOT ASSESSED			
Iron	1.69	3.87	1.95	1.88	1.89	0.82	2.13	<0.01	0.47	
Sulfates	915		1,183	1,012	508	NA	375	234	323	1
Radial Separation(R.S.) from Acid Pond	35'	15'	(25)*	35	115	(45)	45	40	80	
R.S. from Erosion Pond P#2	165'	55	140	145	185	160	195	150	210	

* (25) - Boring below area of abandoned and reclaimed acid pond.
** Cr VI - Hexavalent Chromium as a fraction of Total Chromium.

VII. FINDINGS

The results of the hydrogeologic investigation can be summarized as follows:

1. Groundwater contamination in the fill and alluvial aquifer at the evaporation pond site have occurred as a result of erosion of the clay liner at the point of spent acid discharge. Consequently, the opening permitted rapid seepage through the pond bottom and into the underlying soils and groundwater.
2. The most significant pollutants are chromium and lead. Additional groundwater constituents have shown increases in concentration, including zinc, sulfate and iron.
3. The pollutant plume was rapidly neutralized by the naturally alkaline soils and groundwater and the toxic metals immobilized by precipitation. (i.e. EP Toxicity of chromium in solution are equivalent to 1% to 8% of total chromium in digested aquifer samples.)
4. The ratios of hexavalent chromium to total chromium ranges from 0.5% to 3.8% in digested samples.
5. Analysis of major aquifer parameters including Specific Conductance (Figure 3) and pH (Figure 5) and concentration of sulfates vs. distance (Figure 4) indicate that neutralization of the plume and/or maximum radial excursion does not exceed 300 ft. to 400 ft. from the point of seepage, the erosion pit.

   The decline in pH away from the site is believed to be associated with the final leakage of neutralized solutions which had been rendered alkaline.

FIGURE 3
SPECIFIC CONDUCTANCE OF GROUNDWATER

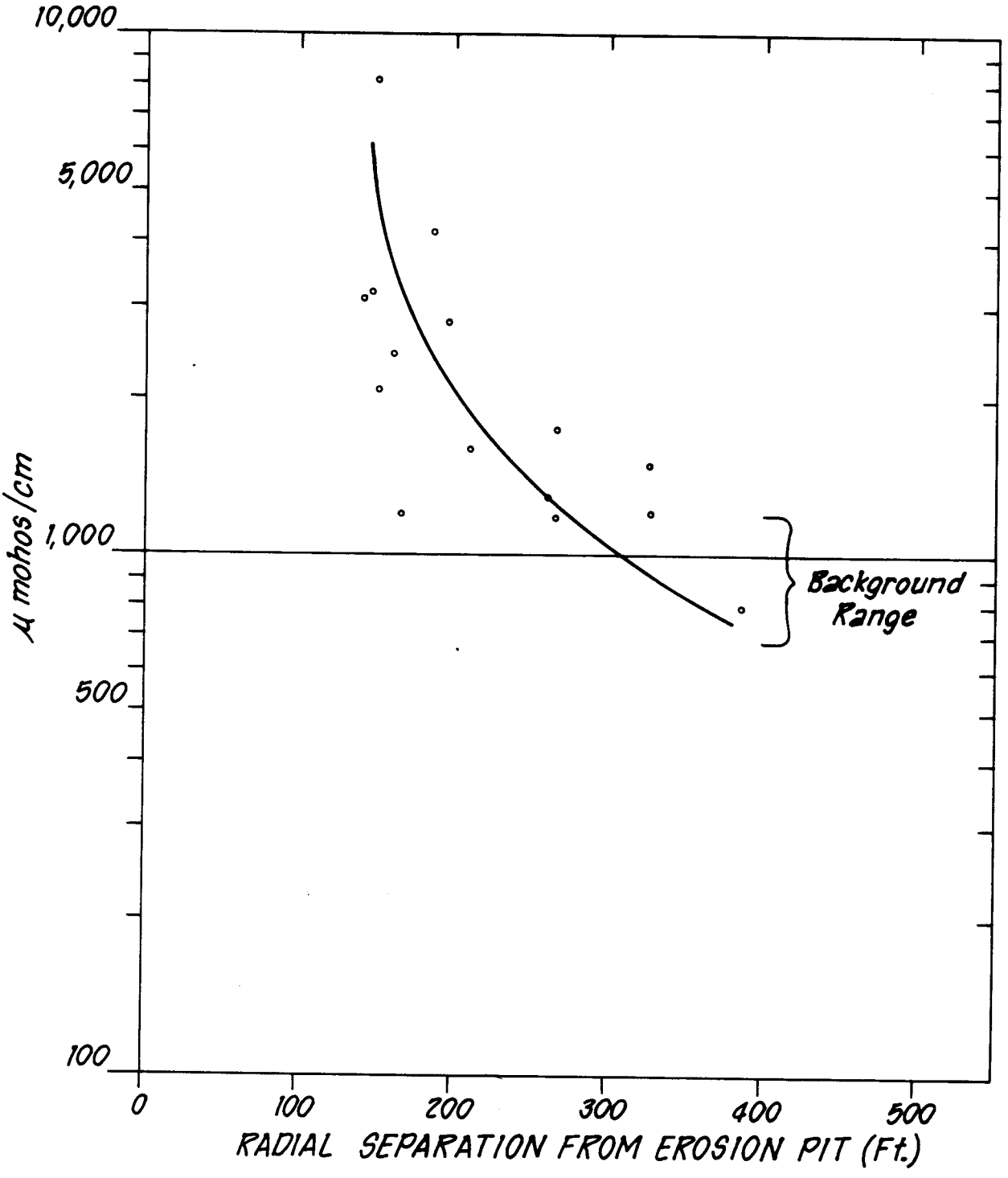


FIGURE 4 SULFATES IN GROUNDWATER

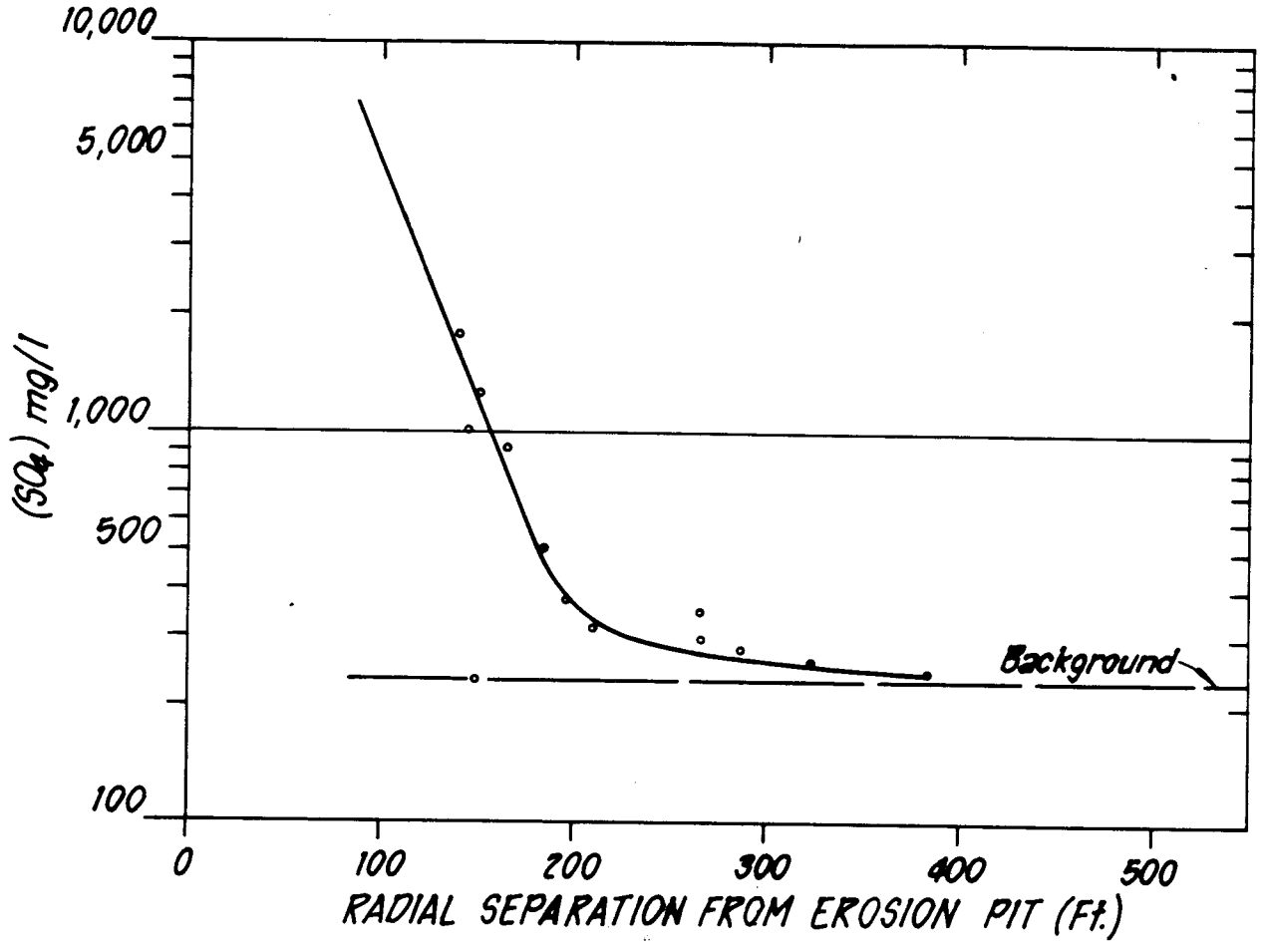
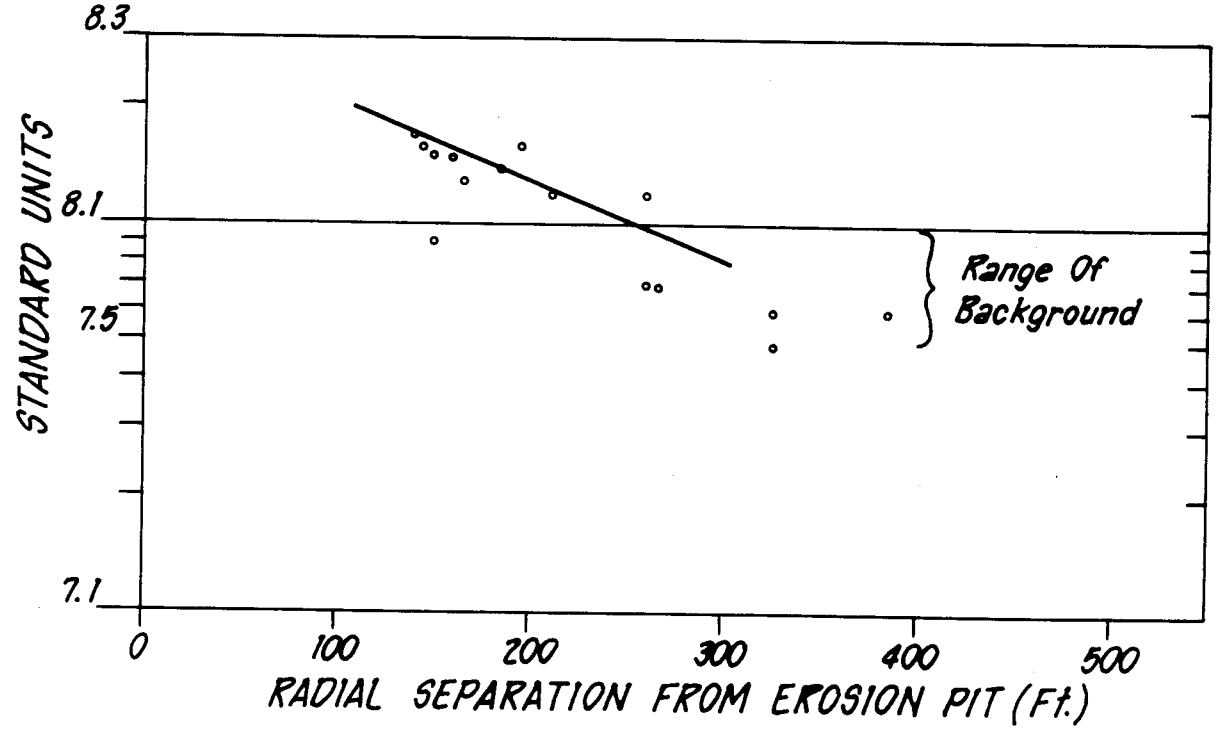


FIGURE 5 ph OF GROUNDWATER



6. Chromium concentrations decrease from as high as 0.35 mg/l to 0.13 mg/l in the southerly direction from the pond in 120 feet from Boring 3 to Boring 14. The same constituent decays in concentration from 0.15 mg/l to 0.04 mg/l within 180 feet from Boring 8 to Boring 12. This decay supports the findings in item 5 above. These decays in chromium concentration represent a 0.1% to 0.3% decrease per foot of plume.

7. Mobilized pollutants can be extracted by interceptor wells, precipitated metals cannot; their removal would require acid leaching and subsequent interception with a ring of interceptor wells.

APPENDIX I

WESTERN LABORATORIES
Materials Engineers
825 "J" Street Lincoln, Nebraska

PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test			Boring No. B-1
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 1 of 2
w = Moisture Content, %	D = Dry Density, pcf	Penetration Resistance: N = Blows per foot		Date: 6-26-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3879.0	0.0	CL-SC	Sandy clay; grayish brown; 30% fine sand; moist; low plasticity; (fill).			
3878.0	1.0	SM	Sandy silt; 10% to 15% fine to medium sand; grayish brown; wet; slight plasticity; (fill).			
3875.0	4.0	CL	Sandy clay; 20 to 30% fine sand; grayish brown; very wet; low plasticity; medium stiff.			
3874.0	5.0	CL	Sandy clay; 30 to 40% fine to medium sand; grayish brown; very wet; medium dense.			Water level 6.8' at time of drilling and 24 hrs after drilling.
3872.0	7.0	SP	Sand; fine to medium grains; 10% silty clays; brown; saturated; interbedded with SC zones.			
3870.0	9.0	SM	Silty sand; 30 to 40% medium sand ($CaCO_3$); brown; saturated; low plasticity; medium stiff.	1A	1 4	
3868.0	11.0	SM	Silty sand; fine to medium sand; 15 to 25% silt with coarse $CaCO_3$ sand fraction; brown; saturated; medium dense.	1B	13	N=17
3866.5	12.5	SM	Silty sand; fine to medium sand; 20 to 30% silt; with coarse $CaCO_3$ sand fraction and $CaCO_3$ gravel; largest clast ½"; brown; saturated; medium dense.	1C	4 5 6	N=11
3864.0	15.0	SM-GM	Silty sand; gravelly; fine to coarse sand; 20 to 30% silt; $CaCO_3$ gravel; largest clast 3/4"; brown; saturated; dense.	10	4 13 24	N=37
3861.5	17.5	GM	Silty gravel; 30 to 40% fine to coarse sand; $CaCO_3$ gravel and coarse sand; brown; reddish yellow stains; saturated; medium dense.			

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BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-1
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 2 of 2
w = Moisture Content, % D = Dry Density, pcf	Penetration Resistance: N = Blows per foot		Date: 6-26-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3859.0	20.0		As above.			
3856.5	22.5	CL	Silty clay; light grayish brown with strong brown stains; saturated; low plasticity; hard. (Weathered Brule FM)	1E	6 11 23	N=34
3854.0	24.0					

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Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test				Boring No. B-2
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler		Sheet 1 of 2
w = Moisture Content, %	D = Dry Density, pcf	Penetration Resistance: N = Blows per foot			Date: 6-26-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3879.9	0.0	CL	Silty clay; 15 to 20% fine sand; grayish brown mottled with dark grayish brown; moist; low plasticity; medium stiff. (fill)			
3876.9	3.0	CL	Sandy clay; 30 to 40% fine sand; grayish brown; wet; low plasticity; medium stiff.			
3874.9	5.0	SP	Sand; fine to coarse sand; 10% fines; occasional $CaCO_3$ gravel; moist; medium dense.		5	Water level 5.2' at time of drilling.
					6	
					6	N=12
					4	
3871.9	8.0	SC	Sandy clay; 40 to 50% fine sand; occasional medium to coarse grains; brown; saturated; medium dense.		4	
					8	N=12
3869.9	10.0	SP	Sand; fine sand; 10% fines; saturated; dense.		6	
					8	
3868.9	11.0	SP	Sand; fine to coarse sand; occasional gravel; saturated; dense.		18	N=26
					4	
3864.4	15.5	GP	Gravel; 20 to 30% fine to coarse sand; saturated.		13	
3863.9	16.0	SP-SC	Sand; 10 to 20% fines; gravel; saturated; dense.		16	N=29

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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-2
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 2 of 2
w = Moisture Content, % D = Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 6-26-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3859.9	20.0				14	
			As above except 15 to 20% $CaCO_3$ gravel.			
3858.9	21.0				14	
3858.4	21.5	CL-CH	Brule formation.		35	N=49

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BORING LOG

PROJECT
Lockwood Acid Pond

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test			Boring No. B-3
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 1 of 2
w = Moisture Content, % D = Dry Density, pcf	Penetration Resistance: N = Blows per foot			Date: 6-27-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3879.1	0.0	CL	Sandy clay; 20 to 30% fine sand; grayish brown; moist; low plasticity; medium stiff. (fill).			
3876.1	3.0	SC	Clayey sand; fine to medium sand with occasional coarse $CaCO_3$ grains; yellowish brown; moist.	3A		
					18	
3868.6	10.5	SM	Silty sand; fine to medium sand with occasional coarse $CaCO_3$ and gravel; largest clast 3/4"; 10 to 20% silt; light brownish gray; saturated; medium dense; some carbonate cementation of fine to medium sands.	3B	13	
					13	N=26
					11	
			Silty sand; fine to coarse sand; $CaCO_3$ coarse grains; pale brown; saturated; dense.		10	
					42	N=52
3859.6	19.5	SM		3C	29	

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Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test			Boring No. B-3
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in.o.d. Split-barrel Sampler	Sheet 2 of 2
w=Moisture Content, % D=Dry Density, pcf	Penetration Resistance: N=Blows per foot			Date: 6-27-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3859.4	20.0					
3858.6	20.5	CH	Brule formation.		64	

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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-4
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 1 of 2
w = Moisture Content, % / D = Dry Density, pcf	Penetration Resistance: N = Blows per foot		Date: 6-27-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3878.8	0.0	SM-SC	Silty sand; 40 to 50% silty clay; fine sand; brown; moist. (fill)		1	
3876.3	2.5	SM	Silty sand; fine sand; 10 to 20% medium grains; dark brown; moist. (fill)	4A	1 1	N=2
3873.8	5.0	SM	Silty sand; fine to medium sand; 20 to 30% medium grains; dark yellowish brown; saturated. (fill)	4B	1 1	N=2 Water level 6.3' at time of drilling.
3871.3	7.5	SM	Silty sand; fine to medium sand; 25 to 35% medium grains; with occasional coarse $CaCO_3$ rounded to subangular grains; light olive brown; moist.	4C	3 1	N=4
3869.8	10.0	SM	Silty sand; fine to medium sand; 20 to 30% medium rounded to subrounded $CaCO_3$ grains; some weathered brule; occassional $CaCO_3$ gravel; largest clast 3/4"; yellowish brown; saturated.	4D	5 5	N=10
3863.8	15.0	SM	Silty sand; fine to medium sand; 5 to 10% coarse $CaCO_3$ grains; with occasional $CaCO_3$ gravel; yellowish brown; saturated; medium dense.	4E	8 17	N=25
					18	

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BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-4
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 2 of 2
w = Moisture Content, % / D = Dry Density, pcf	Penetration Resistance: N = Blows per foot		Date: 6-27-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3858.8	20.0	SM	Silty sand; fine to coarse sand; with $CaCO_3$ gravel; largest clast 3/4"; pale brown; saturated; dense.	4F	20 21	N=41
3853.8	25.0				5	
3852.8	26.0	CL	Silty clay; light yellowish brown. (Weathered Brule)	4G	8 6	N=14

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Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D.x3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-5
Undisturbed Soil Sampler: 3-in.o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall	2-in.o.d. Split-barrel Sampler	Sheet 1 of 2
w=Moisture Content, % / D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 6-28-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3878.5	0.0	SM	Sandy silt; dark grayish brown; 30 to 40% fine sand; soft; occasional medium sand grains. (Fill)		1	
3876.0	2.5	CL-ML	Silty clay; fine sand; dark brown; moist; soft; some organic material; slight plasticity. (Fill)	5A	1 1 2	N=2
3873.5	5.0	SM	Silty sand; 30 to 40% medium snad; 40 to 50% fine sand; 15 to 25% silt; occasional coarse $CaCO_3$ grains; brown; moist; medium stiff.	5B	3 3 2	N=6 Water level 6.3' at time of drilling.
3871.0	7.5	SM	Silty sand; 20 to 30% medium sand; 30 to 40% fine sand; 25 to 35% silt; dark yellowish brown; saturated; soft.	5C	1 3 10	N=4
3868.5	10.0		Silty sand; fine to coarse sand; with $CaCO_3$ gravel; largest clast 3/4"; 20 to 30% silt; brown; saturated; medium dense.	5D	10 12 7	N=22
3863.5	15.0	SM	Silty sand; fine to medium sand; with $CaCO_3$ gravel; largest clast 3/4"; 15 to 25% silt; brown; saturated; medium dense.	5E	11 17 8	N=28

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825 "J" Street Lincoln, Nebraska

PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-5
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall / 2-in. o.d. Split-barrel Sampler		Sheet 2 of 2
w = Moisture Content, % / D = Dry Density, pcf	Penetration Resistance: N = Blows per foot		Date: 6-28-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3858.5	20.0	SM-GM	Silty sand; fine to coarse sand; with $CaCO_3$ coarse grains and gravel; 20 to 30% silt; pale brown; saturated; medium dense.	5F	10 11	N=21
3853.5	25.0				5	
		CL	Silty clay; light brown: saturated; slightly plastic; very stiff. (Brule)	5G	7 18	N=25
3852.5	26.0					

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825 "J" Street Lincoln, Nebraska

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Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test	Boring No. B-6
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall / 2-in.o.d. Split-barrel Sampler	Sheet 1 of 2
w=Moisture Content, % / D=Dry Density, pcf	Penetration Resistance: N=Blows per foot	Date: 7-2-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3882.0	0.0	CL	Sandy clay; 20 to 30% fine sand; grayish brown; low plasticity; moist; soft. (Fill)		2	
3877.0	5.0	SM	Silty sand; fine to medium sand; 10 to 20% medium sand; 40 to 50% fine sand; grains predominately soft $CaCO_3$; olive brown; wet; soft.	6A	2 2	N= 4
3874.5	7.5	SM	Silty sand; fine to medium sand; 15 to 25% silt; yellowish brown; wet; medium stiff.	6B	4 4 8	ph-7.4 N=8 Water level 9.3' at time of drilling. ph-7.3
3872.0	10.0	SM	Silty sand; fine to medium sand; with occasional $CaCO_3$ gravel; largest clast 3/4"; 15 to 25% silt; 5 to 10% coarse $CaCO_3$ grains; brown; saturated; medium dense.	6C	10 11 6	N=21
3867.0	15.0	SM	Silty sand; fine to medium sand; with $CaCO_3$ gravel; 5 to 10% coarse $CaCO_3$ grains; 10 to 20% silt; brown; saturated; very stiff.	6D	7 9 10	ph-7.6 N=16

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Lockwood Acid Pond

BORING LOG

Boring Method: 6-in. continuous flight auger	Standard Penetration Test			Boring No. B-6
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in.o.d. Split-barrel Sampler	Sheet 2 of 2
w=Moisture Content, % D=Dry Density, pcf	Penetration Resistance: N=Blows per foot			Date:7-2-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3862.0	20.0	SM	Silty sand; fine to coarse sand; with occasional $CaCO_3$ gravel and coarse grains; largest clast 3/4"; 25 to 35% silt; yellowish brown; saturated; dense.	6E	15 25	ph-7.6 N=40
					8	
3857.0	25.0	SM	Silty sand; fine to medium sand: 30 to 40% silt; with occasional $CaCO_3$ gravel; largest clast 1"; Weathered brule; yellowish brown; saturated; dense at 25.8 ft.	6F	10 21	ph-7.1 N=31
3856.0	26.0					

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Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test			Boring No. B-7
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 1 of 2
w=Moisture Content, % D=Dry Density, pcf	Penetration Resistance: N=Blows per foot			Date: 6-28-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3878.9	0.0	SM-ML	Sandy silt; grayish brown; 30 to 40% fine sand; with occassional medium sands; loose; moist.		1	
3876.4	2.5	SM	Silty sand; fine to medium sand; 25 to 35% silt; with occasional coarse $CaCO_3$ grains; brown; saturated; loose. (Fill)	7A	1 1	ph-7.5 N=2
3873.9	5.0	GM	Silty gravel; $CaCO_3$ gravel; largest clast 3/4"; some sand and silt; brown; saturated; medium dense.	7B	4 8 9	ph-7.7 Water level 5.6' 7-5-84 N=17 Water level 6.2' at time of drilling.
3868.9	10.0	GM-SM	Silty gravel; 30 to 40% silt; 10 to 15% sand; $CaCO_3$ gravel; brown; saturated; medium dense.	7C	7 5 5	ph-7.5 N=10
3863.9	15.0	SM	Silty sand; fine to coarse sand; coarse $CaCO_3$ grains; with occasional $CaCO_3$ gravel; brown; saturated; medium dense.	7D	9 11 17	ph-7.9 N=28
					8	

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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test			Boring No. B-7
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 2 of 2
w = Moisture Content, % D = Dry Density, pcf	Penetration Resistance: N=Blows per foot			Date: 6-28-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3858.9	20.0	SM	Silty sand; fine to medium sand; 5 to 10% coarse $CaCO_3$ grains; 35 to 45% silt; with occasional $CaCO_3$ gravel; largest clast - 3/4"; yellowish brown; saturated; medium dense.	7E	11 17	ph-7.9 N=28
3853.9	25.0				4	ph-8.2
3852.9	26.0	CL	Silty clay; pale brown; saturated; low plasticity; very stiff. (Weathered Brule)	7F	7 17	N=24

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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D.x3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-8
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall / 2-in.o.d. Split-barrel Sampler		Sheet 1 of 2
w=Moisture Content, % / D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 7-2-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3878.9	0.0	SM	Sandy silt; 30 to 40% fine sand; grayish brown; moist. (Fill)		1	
3876.4	2.5	CL	Sandy clay; 20 to 30% fine sand; dark yellowish brown; moist; low plasticity; soft. (Fill)	8A	1 1	N=2
					2	ph-8.1
3873.9	5.0	SM	Silty sand; fine to coarse sand; 15 to 25% silt; with $CaCO_3$ grains and occasional $CaCO_3$ gravel; light olive brown; moist.	8B	5 9	N=14 Water level 5.3 at time of drilling Water level 6.0' 7-5-84
					8	
3871.4	7.5	SM	Silty sand; fine to medium sand; 15 to 25% silt; with occasional $CaCO_3$ gravel; olive brown; saturated; loose.	8C	5 3	N=8 ph-7.5
					15	ph-7.7
3868.9	10.0	GM-SM	Gravelly silty sand; $CaCO_3$ gravel; fine to coarse sand; 15 to 25% silt; light yellowish brown; saturated; medium dense.	8D	12 15	N=27
					11	
3863.9	15.0	GM-SM	Gravelly silty sand; $CaCO_3$ gravel; fine to medium sand; yellowish brown; saturated; dense.	8E	17 25	N=42 ph-7.9
					7	

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BORING LOG

PROJECT

Lockwood Acid Pond

Boring Method: 6-in. continuous flight auger	Standard Penetration Test		Boring No. B-8
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall / 2-in. o.d. Split-barrel Sampler		Sheet 2 of 2
w=Moisture Content, % / D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 7-2-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3858.9	20.0	SM	Silty sand; fine to coarse sand; with occasional $CaCO_3$ gravel; yellowish brown; saturated; medium dense.	8F	8 / 10	ph-7.9 N=18
3857.9	21.0					

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Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test				Boring No. B-9
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler		Sheet 1 of 2
w = Moisture Content, % D = Dry Density, pcf	Penetration Resistance: N = Blows per foot				Date: 7-3-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3879.3	0.0	SM	Sandy silt; 10 to 20% fine to medium sand; grayish brown; wet; stiff. (Fill)		2	
3876.8	2.5	CL	Sandy clay; 15 to 25% fine sand; dark yellowish brown; moist; low plasticity; medium stiff.	9A	2 2	ph-7.4 N=4
3874.3	5.0	SM	Silty sand; fine to medium sand; with coarse $CaCO_3$ grains; 20 to 30% silt; yellowish brown; saturated; loose.	9B	2 2	ph-7.1 N=4
					2	Water level 7' 7-5-84 Water level 7.3' at time of drilling.
3871.4	7.5	SM	Silty sand; fine to medium sand; 10 to 20% silt; dark yellowish brown; saturated; loose.	9C	3 1 4	ph-7.4 N=4
3869.3	10.0	SM	Silty sand; fine sand with some medium grains; 15 to 25% silt; dark yellowish brown; saturated; loose.	9D	3 6 16	ph-7.5 N=9
3864.3	15.0	GM-SM	Gravelly silty sand; $CaCO_3$ gravel; grayish brown; saturated; dense.	9E	15 18 9	ph-7.9 N=33

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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-9
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall / 2-in. o.d. Split-barrel Sampler		Sheet 2 of 2
w=Moisture Content, % / D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 7-3-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3859.3	20.0	CL	Silty clay; brown; very stiff; (Brule)	9F	10 19	ph-7.6 N=29
3858.3	21.0					

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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-10
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall	2-in.o.d. Split-barrel Sampler	Sheet 1 of 2
w=Moisture Content, % / D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 7-3-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3878.6	0.0	SM	Sandy silt; 20 to 30% fine to medum sand; grayish brown; wet. (Fill)			
					2	ph-7.2
3876.1	2.5	SM	Silty sand; fine to medium sand; 30 to 40% silt; with occasional $CaCO_3$ gravel; dark yellowish brown; moist; loose. (Fill)		3	
				10A	1	N=4
					2	
3871.6	5.0	SM	Silty sand; fine to medium sand; with occasional coarse grains of weathered Brule; 15 to 25% silt; yellowish brown; saturated; loose.		1	ph-8.0
				10B	1	N=2
					9	Water level 7.3' at time of drilling. ph-7.4
3871.1	7.5	GM	Silty gravel; 10 to 15% silt; $CaCO_3$ gravel; largest clast 1"; yellowish brown; gravel has yellow stains; saturated; medium dense.		10	Water level 7.6' 7-5-84
				10C	5	N=15
					7	
3868.6	10.0	SM-GM	Silty sandy gravel; 30 to 40% silt; 10% fine to medium sand; $CaCO_3$ gravel; pale brown; saturated; medium dense.		7	ph-7.1
				10D	12	N=19
					8	
3863.6	15.0	SM	Silty sand; fine to medium sand; 20 to 30% silt; with $CaCO_3$ gravel; grayish brown; saturated; medium dense.		9	ph-7.9
				10E	13	N=22

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PROJECT
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BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-10
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall / 2-in. o.d. Split-barrel Sampler		Sheet 2 of 2
w = Moisture Content, % / D = Dry Density, pcf	Penetration Resistance: N = Blows per foot		Date: 7-3-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3858.6	20.0	SM-GM	Silty sandy gravel; 10 to 20% silt; with $CaCO_3$ gravels; dark yellowish brown; saturated; medium dense.	10F	10/16	ph-7.0 N=26
3857.6	21.0					

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PROJECT
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BORING LOG

Boring Method: 8" O.D.x3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-11
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall	2-in.o.d. Split-barrel Sampler	Sheet 1 of 2
w=Moisture Content, % / D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 7-3-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3879.9	0.0	CL	Sandy clay; grayish brown; slight to low plasticity; moist; medium stiff.		6	
3877.4	2.5	CL	Sandy clay; 20 to 30% fine sand; olive brown; moist; stiff.	11A	7 8 4	ph-7.4 N=15
3874.9	5.0	SM	Silty sand; fine sand; 25 to 35% silt; with occasional soft subangular $CaCO_3$ gravel; saturated; loose.	11B	4 4 7	ph-7.4 N=8 Water level 6.8' 7-5-84 Water level 7.4' at time of drilling.
3872.4	7.5	SM	Silty sand; fine to medium sand; 10 to 20% silt; with occasional	11C	8 9 10	ph-7.9 N=17
3869.9	10.0	SM-GM	Silty sand; 50% fine to coarse sand; 25 to 35% silt; with occasional soft to medium soft $CaCO_3$ gravel; largest clast 1"; saturated; medium dense.	11D	10 9 5	ph-7.7 N=19
3864.9	15.0	SM	Silty sand; fine sand; 15 to 25% silt; 30 to 40% soft to medium soft $CaCO_3$ gravel; largest clast 3/4"; olive brown; saturated; medium dense.	11E	10 12 8	ph-7.6 N=22

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Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D.x3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-11
Undisturbed Soil Sampler: 3-in.o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in.o.d. Split-barrel Sampler	Sheet 2 of 2
w=Moisture Content, % D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 7-3-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3859.9	20.0	GM	Silty gravel; 20 to 30% fine sand; 20 to 30% silt; light yellowish brown; saturated; medium dense.	11F	15 13	ph-8.1 N=28
3854.9	25.0				6	ph-8.1
3853.9	26.0	CL	Silty clay; 5 to 10% fine sand; 10 to 20% clay; hard. (Brule Fm)	11G	13 21	N=34

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PROJECT
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BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-12
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 1 of 2
w = Moisture Content, % / D = Dry Density, pcf	Penetration Resistance: N = Blows per foot		Date: 8-29-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3881.6	0.0	SM	Silty sand; fine sand with occasional coarse grains; very dark grayish brown; moist; low plasticity; stiff to very stiff; roots and other organics.		7	
				12A	6 10	N=16
3877.4	4.2	SM	Silty sand; fine to medium sand; with some gravel; dark brown; wet; very low to non-plastic; medium stiff.		2	
				12B	2 3	N=5
3874.1	7.5	SM	Silty sand; fine sand; light olive brown; saturated; non-plastic; soft.		2	Water level 7.5' immediately after drilling; 7.4' 24 hours later.
				12C	1 1	N=2
				12D	6 9 8	N=17
3869.1	12.5	SM	Silty sand; fine sand with 15 to 20% coarse grains and gravel; yellowish brown; moist; very low plasticity; stiff.		4	
				12E	6 7	N=13
					4 3 4	N=7
3865.3	16.3	SM	Silty sand; fine sand with 25 to 30% medium coarse sand and gravel; brown; moist; very low plasticity; hard.		7	
				12F	18 32	N=50
					7	

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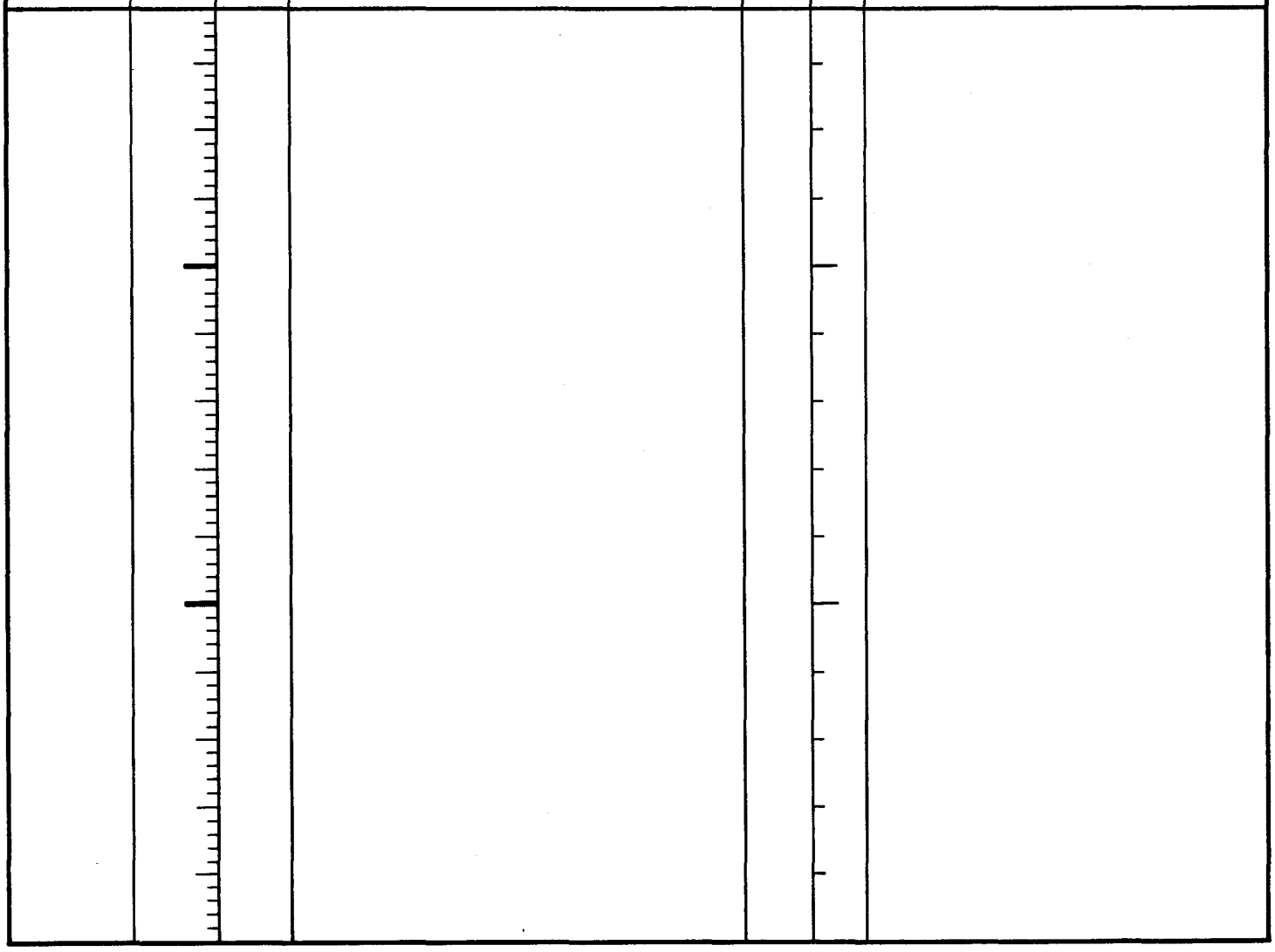
BORING LOG

Boring Method: 8" O.D.x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-12
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall	2-in.o.d. Split-barrel Sampler	Sheet 2 of 2
w=Moisture Content, % / D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 8-29-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3861.6	20.0	GM	Silty gravel; gravel sand silt mixture; 80% fine to coarse sand; largest clast 1¾"; light yellowish brown; non-plastic; hard.	12G	17 20	N=37
					10	
3859.1	22.5	SM	Silty sand; fine to medium sand with occasional coarse grains and gravel; pale brown; moist; low plasticity; very stiff.	12H	10 8	N=18
					5	
3855.6	26.0			12I	11 21	N=32



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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-13
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 1 of 2
w = Moisture Content, %	D = Dry Density, pcf	Penetration Resistance: N = Blows per foot		Date: 8-24-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3881.6	0.0		County road fill.			
3880.6	1.0	SM-SC	Silty sand; fine to medium sand with some coarse grains; light yellowish brown; moist; slight plasticity; very stiff. (Fill)		12	
				13A	11	
3878.6	3.0				7	N=18
		CL	Silty clay; 10 to 15% fine sand; very dark grayish brown; moist; low plasticity; soft.		2	
				13B	1	
					2	N=3
3875.4	6.2	SM	Silty sand; fine sand; 20 to 30% clayey silt; brown; wet to saturated; slight plasticity; stiff.		3	Water level 7.5' at time of drilling; 8.3' 24 hrs. after drilling.
				13C	3	
					2	N=5
					3	
3871.6	10.0	SM	Silty sand; 10 to 20% silt with coarse grains and gravel.	13D	5	
					5	N=10
3870.4	11.2	GM	Silty gravels; gravel, sand, silt mixture; 40 to 50% fine to coarse sand; brown; saturated; largest clast 1½" in diameter.		11	
				13E	13	
					19	N=32
					13	
3866.6	15.0	SM	Silty sand; fine to medium sand with occasional coarse grains; 10 to 20% silt; brown; moist; non-plastic; very stiff.	13F	14	
					23	N=37
					13	
				13G	16	
					19	N=35
					11	

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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test				Boring No. B-13
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in.o.d. Split-barrel Sampler		Sheet 2 of 2
w=Moisture Content, % D=Dry Density, pcf	Penetration Resistance: N=Blows per foot				Date: 8-24-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3861.6	20.0		As above.	13H	20 37	N=57
					15	
3859.1	22.5	SM	Silty sand; fine to medium sand with occasional coarse grains and gravel; largest clast 1¼"; silt fraction; brown; moist; non-plastic; hard.	13I	19 26	N=45
					6	
3856.6	25.0	SM	Silty sand; fine sand; brown; moist; very low plasticity; hard.	13J	8 14	N=22
3855.7	25.9					

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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D.x3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-14
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall / 2-in.o.d. Split-barrel Sampler		Sheet 1 of 2
w=Moisture Content, % / D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 8-27-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3882.2	0.0		Fill: Road bed gravel.			
3881.3	0.9	SM	Silty sand; fine sand with occasional coarse grains; brown; moist; low plasticity; very stiff.	14A	9 9 7	N=16
3878.0	4.2	CL	Silty clay; 5 to 10% fine sand; dark grayish brown; moist; low to medium plasticity; medium stiff.	14B	3 3 4	N=7
3875.4	6.8	SM	Silty sand; fine sand with occasional coarse carbonate grains; brown; moist; low plasticity; medium stiff.	14C	2 2 3	N=5 — Water level at 8.5' immediately after drilling; 8.1' 24 hours later.
3872.2	10.0	SM	Silty sand; medium sand with 10% coarse sand and occasional gravel; brown; saturated; non-plastic; medium stiff.	14D	2 3 2	N=5
3869.7	12.5	CL	Silty clay; 5% fine sand; brown; saturated; low to medium plasticity; soft.	14E	1 1 1	N=2
3867.2	15.0	GM	Silty gravel; gravel, sand, silt mixture; 70% fine to medium sand; brown; very wet; non-plastic; very stiff.	14F	8 11 17	N=28
3864.7	17.5	SM	Silty sand; 80% fine to medium sand; brown; wet; non-plastic; very stiff.	14G	15 11 14	N=25
					11	

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BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-14
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall / 2-in. o.d. Split-barrel Sampler		Sheet 2 of 2
w=Moisture Content, % / D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 8-27-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3862.2	20.0	SM	Silty sand; As above except with occasional gravel; largest clast 1 ¼" in diameter.	14H	20 31	N=51
3859.7	22.5	SM	Silty sand; fine sand with occasional coarse grains; brown; moist; very low plasticity; hard.	14I	13 16 22	N=38
3857.2	25.0	SM	Silty sand; fine to medium sand with occasional coarse grains; brown; moist; low plasticity; hard.	14J	12 20 20	N=40
3854.2	28.0	CL	Silty clay; light grayish brown; medium plasticity; hard. (Brule Fm)		10 12 15 14	N=27
3851.2	31.0			14K	26 60	N=86

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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test	Boring No. B-15
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer / 30-in. Fall / 2-in. o.d. Split-barrel Sampler	Sheet 1 of 2
w = Moisture Content, % / D = Dry Density, pcf	Penetration Resistance: N = Blows per foot	Date: 8-30-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3878.0	0.0	SM	Silty sand; fine sand with occasional medium and coarse grains; dark grayish brown; moist; low plasticity; soft. (Fill)		2	
				15A	1 1	N=2
3873.9	4.1	SM	Silty sand; fine sand; brown; moist; very low plasticity; soft. (Fill)		1	Water level at 5.0' immediately after drilling 4.8' 24 hours later
				15B	1 1	N=2
					8	
3870.5	7.5	SM	Silty sand; fine to medium sand with occasional coarse grains and gravel; largest clast 1" in diameter; brown; moist; non-plastic; very stiff.	15C	9 11	N=20
3868.9	9.1	GM	Silty gravel; gravel, sand, silt mixture; 60% fine to medium sand; largest clast 1" in diameter; brown; wet; non-plastic; very stiff.		10	
				15D	12 15	N=27
					12	
				15E	19 18	N=37
					10	
3863.0	15.0	SM	Silty sand; fine sand with occasional coarse grains and gravel; brown; very wet; very low plasticity; very stiff.	15F	11 17	N=28
					17	
3860.5	17.5	SM	Silty sand; fine to medium sand with occasional coarse carbonate grains; brown; moist; very low to non-plastic; hard.	15G	23 26	N=49
					17	

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BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-15
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 2 of 2
w=Moisture Content, % D=Dry Density, pcf	Penetration Resistance: N=Blows per foot		Date: 8-30-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3858.0	20.0	SM	Silty sand; fine sand with occasional coarse grains; brown; moist; low plasticity; hard.	15H	19 20	N=39
					7	
3855.5	22.5	CL	Silty clay; brown; moist; low to medium plasticity; very stiff. (Brule Fm)	15I	9 13	N=22
3854.0	24.0					

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PROJECT
Lockwood Acid Pond

BORING LOG

Boring Method: 8" O.D. x 3-1/4" I.D. Hollow-Stem Auger	Standard Penetration Test		Boring No. B-16
Undisturbed Soil Sampler: 3-in. o.d. thin-walled tube	140-lb. Hammer	30-in. Fall	2-in. o.d. Split-barrel Sampler	Sheet 1 of 1
w = Moisture Content, % D = Dry Density, pcf	Penetration Resistance: N=Blows per foot			Date: 8-30-84

Elevation	Depth	Group Symbol	Description of Materials	Sample No.	Blows	Remarks
3879.8	0.0	SM	Silty sand; brown; 20 to 30% fine to medium sand; loose; moist. (Fill)			
3877.6	2.2	CL	Silty clay; 10 to 15% fine sand; dark grayish brown; moist; low plasticity; soft.	16A	2 2 2	N=4
3875.3	4.5	SM	Silty sand; fine sand with occasional grains; brown; moist; low plasticity; soft.	16B	2 2 2	N=4
					4	Water level at 7.0' immediately after drilling 7.4' 24 hours later.
3872.3	7.5	SM	Silty sand; fine sand with occasional coarse grains; brown; moist; non-plastic; very stiff.	16C	6 11	N=17
					4	
3869.8	10.0	SM	Silty sand; fine sand with occasional medium to coarse grains and gravel; largest clast 7/8"; yellowish brown; moist; non-plastic; stiff.	16D	6 5	N=11
					9	
				16E	17 17	N=34
					13	
				16F	21 27	N=48
					19	
3862.3	17.5	SM	Silty sand; fine sand with occasional coarse grains and gravel; brown; moist; very low plasticity; very stiff.	16G	8 15	N=23
3861.8	18.0					

APPENDIX II

STATE OF NEBRASKA

ROBERT KERREY • GOVERNOR • DENNIS GRAMS • DIRECTOR

June 27, 1984

Mr. Jerry Carpenter
Gering Water Dept.
1450 10th Street
Gering, Nebraska 69341

Dear Mr. Carpenter:

I have enclosed the water quality analysis data for Gering's municipal well #6 and two private wells in the area.

The metal concentrations in Table 3 reflect only the dissolved portion in the water. The metal concentrations in Table 4 reflect the amounts dissolved in the water and attached to the sediment. Table 5 lists the Drinking Water Standards for the respective metals.

As you can see, all the metal concentrations are within the maximum recommended levels. If you have any questions, please contact me at (402) 471-4230.

Sincerely,

Bill Imig
Environmental Specialist
Surveillance & Analysis Section
Water & Waste Management Division

BI/tsk
enclosure

GROUND WATER MONITORING NEAR LOCKWOOD CORP.

Table 3

LEACHABLE METALS (E.P. TOXIC)
April 18, 1984

PARAMETERS	SAMPLE SITE		
	MUNICIPAL WELL	PRIVATE A	PRIVATE B
Arsenic mg/l	.011	.020	.022
Cadmium mg/l	.002 K	.002 K	.002 K
Chromium VI mg/l	.003 u	.003 u	.003 u
Lead mg/l	.012	.014	.014
Selenium mg/l	.005	.005 u	.005 u
Silver mg/l	.0005 K	.0005 K	.0005 K

Table 4

TOTAL METALS
April 18, 1984

PARAMETERS	SAMPLE SITE		
	MUNICIPAL WELL	PRIVATE A	PRIVATE B
pH s.u.	7.5	7.7	7.4
Arsenic mg/l	.014	.022	.024
Lead mg/l	.013	.012	.014
Zinc mg/l	.012	.027	.015
Chromium mg/l	.006	.004	.005
Cadmium mg/l	.002 K	.002 K	.002 K
Silver mg/l	.0005 K	.0005 K	.0005 K
Selenium mg/l	.005 u	.005 u	.005 u
Chromium VI mg/l	.003 u	.003 u	.003 u

u = Analyzed for, but not detected. Method detection limit listed.

K = Actual value known to be less than value given. Method detection limit listed.

Table 5

DRINKING WATER STANDARDS
SOURCES: U.S. ENVIRONMENTAL PROTECTION AGENCY, 1975 and
WORLD HEATLH ORGANIZATION, EUROPEAN STANDARDS, 1970

PARAMETER	RECOMMENDED CONCENTRATION LIMIT (mg/l)
Arsenic	.05
Lead	.05
Zinc	5.0
Chromium VI	.05
Cadmium	.01
Silver	.05
Selenium	.01

APPENDIX III

August 27, 1984

Nebraska Department of Environmental Control
Box 94877, State House Station
301 Centennial Mall South
Lincoln, Nebraska 68509

ATTENTION: Mike Steffensmeier, Acting Chief
Hazardous Waste Management Section

REFERENCE: Lockwood Corporation Case No. 756
Status Report on Hydrogeologic Investigation

Dear Mr. Steffensmeier:

A preliminary hydrogeologic investigation has been performed at Lockwood Corporation, Gering, Nebraska. The investigation is in response to Nebraska Department of Environmental Control, Administrative Order of June 20, 1984, item 3.

An extention was requested and received with deadline set at August 27th, 1984. This letter represents the status report of findings and conclusions to date concerning the groundwater setting in and about the Lockwood spent acid lagoons.

The purpose of the investigation were to determine 1) if toxic levels of leachable metals had reached the aquifer 2) if so, the nature of the metals excursion and 3) remedial action for aquifer restoration.

Included in the investigation are the following items:

1. Review of existing soil and geologic reports and review of registered well logs.

2. A subsurface investigation by auger borings at the site according to ASTM Designation D 1452-65 (Revised 1980) and sampling with split-barrel sampler according to ASTM Designation D 1586-67, Groundwater sampling in bore holes by PVC bailer according to ASTM Designation D 3370.

3. Analysis of groundwater samples include cadmium, chromium, zinc, iron, sulfates in mg/l and the parameters: temperature, pH and specific conductance.

Please find attached Sheet 1, a boring plan for the site, Table 1, Analysis of Lagoon and Groundwater Samples complied from NDEC Investigation Report dated April 18, 1984 and NMS laboratory analysis of August 15, 1984. These documents are preliminary and subject to addition and revision in the final report.

PRELIMINARY FINDINGS

The results of a preliminary subsurface investigation within 150 radial feet of the spent acid lagoons revealed a three unit aquifer consisting of a upper unit (1) of silty and sandy clay ranging in thickness from 7.0 ft to 10.0 ft; a sand and gravel unit (2) composed of a combination of siliceous and carbonate grains and a silty clay/ gravely clay unit (3) the weathered surface of the Brule Formation. Unit 2 ranges in thickness from 10 ft to 12 ft and contained interbedded silty and sandy clays. Unit 3 acts as an aquitard at the site and was penetrated at each boring at a depth of between 19.5 ft and 25.0 ft.

Groundwater occurrence at the site is unconfined in unit 2 and semiconfined to confined in the Brule Formation underlying the weathered unit 3. Flow in unit 2 is regionally toward the North Platte River but locally north to south. This flow results from recharge at the north property boundary by an irrigation canal and discharge to the south by the Gering Drain. Flow in the Brule Fm. was not assessed.

Local wells including the Gering Municipal Well #77-1 and several registered irrigation wells all are deeply penetrating the Brule Fm. This is the consequence of low transmissivity in this aquifer unit.

Groundwater quality in the Brule Fm. is variable but generally calcium bicarbonate and sodium bicarbonate according to U.S. Geologic Survey Water-Supply Paper 943, 1946. Nebraska Department of Health records indicate the Gering Municipal well has sodium-bicarbonate type water. We requested sampling of this well on 3/6/84 and testing specifically for chromium.

The preliminary groundwater analysis results are as follows:

1. Chromium concentrations range from 0.05 mg/l to 0.15 mg/l within 150 radial ft of the lagoons.

2. Chromium concentration diminishes significantly away from the lagoons in areas of occurrence. (see Table 1 and Sheet 1)

   a. B-8, cr = 0.15 mg/l to B-11, cr = 0.10 mg/l; separation = 120 ft
   b. B-1, cr = 0.10 mg/l; B-9 cr 0.05 mg/l; separation 43 ft

3. Groundwater conditions are alkaline and suitable to precipitation of chromium from solution as a salt.

4. Zinc concentrations range from 0.01 mg/l to 1.31 mg/l.

5. Additional borings and sampling at greater radial separation will be necessary to determine the furthest occurrence of chromium from the lagoons.

6. Lack of etching on carbonate grains in units 1 and 2 indicate alkaline conditions and not acid corrosion of the grains.

CONCLUSIONS & RECOMMENDATIONS

Our conclusions are based on a limited number borings. We are currently extending the radius of investigation in all directions and expect to have the results of groundwater sample analysis in two to four weeks time.

Based on data to date we have made the following conclusions:

1. Lagoon leakage occurred in the north pond in association with clay liner erosion at the terminus of the discharge pipe.

2. Naturally high alkalinity provides a groundwater environment suitable for precipitation of heavy metals.

3. Dilution and/or precipitation of chromium from groundwater occurs within the immediate vicinity of the lagoons. Further investigation is in progress to determine the concentration gradient.

4. Zinc and cadmium, although present at high concentrations in the pond sludges, precipitate out of infiltrating solutions in the alkaline soil and groundwater.

5. Absence of etching on carbonate grains indicate decay of the infiltrating spent acid front to normal or alkaline pH in the upper few inches to feet of the underlying soils. This is consistent with the SCS soil survey of Scotts Bluff County - 1968 which indicates the pre-site conditions as a wet variant of the Mitchell Silt loam and "scabby". This was a natural groundwater discharge site and as a result had developed a high concentration of salts prior to use due to evaporation.

We recommend the following actions:

1. Complete the subsurface investigation at 200 to 250 radial feet from the ponds.

2. Instigate closure of the spent acid lagoons.

3. Install four (4) groundwater monitoring wells fully penetrating unit 2. Sample these wells on a quarterly basis for 1 year and test the samples for the presence of chromium cadmium, zinc, iron, sulfates, pH and specific conductance. If at the end of one year, no evidence exists of significant increase in these constituents or changes in the parameters reduce monitoring to biannual for two additional years. Location and design of the wells will be submitted at completion of the investigation.

4. If spent acid liquors are to be disposed of at this facility repair of the clay liner or construction of lined evaporation pond will be appropriate for protection of the groundwater.

We respectfully request your permission to extend the date of completion of the hydrogeologic investigation to September 24, 1984.

Sincerely,

HOSKINS-WESTERN-SONDEREGGER, INC.

By_____
Roy W. Elliott
Certified Professional Geologist #6684

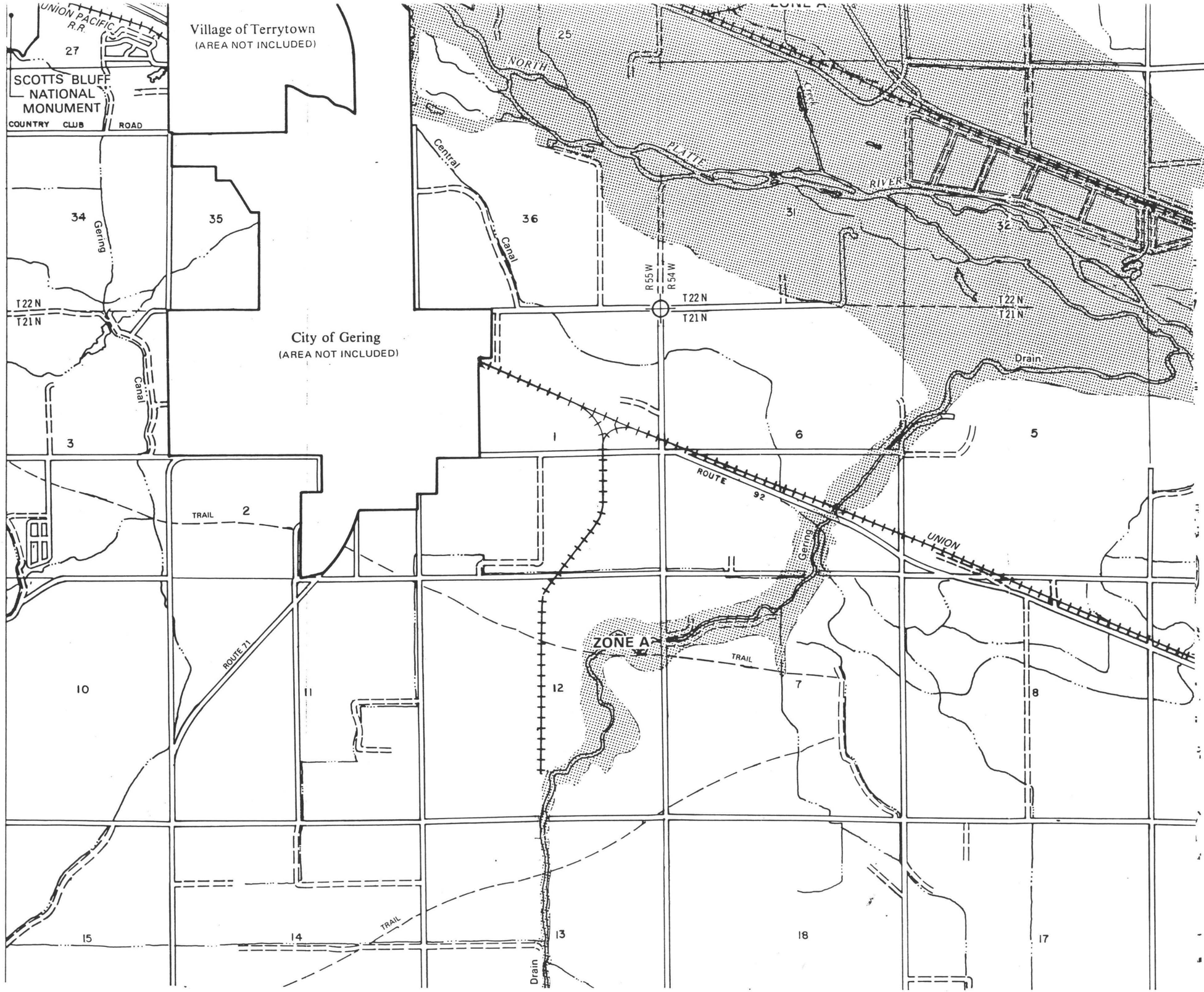
RWE/vm
84/3936
Enclosure
1 cc: Ray Dugan, General Foreman
Lockwood Corp.
1 cc: Gary Brandt

Table 1 Analysis of Lagoon & Groundwater Samples

Parameters	Recommended Concentration Limit (mg/l)	Municipal Well #6 4/18/84	B-1	B-2	B-3	B-4	B-5	B-6	B-7	B-8	B-9	B-10	B-11
			(6/29/84)										
Arsenic	0.05	0.014	N.A.										
Lead	0.05	0.013	N.A.										
Zinc	5.0	0.012	< 0.01	1.13	1.31	0.15	0.02	0.04	< 0.01	< 0.01	0.03	0.05	0.03
Chromium	0.05	0.006	~~< 0.01~~ 0.10	< 0.05	NA	< 0.05	< 0.05	0.12	0.10	0.15	< 0.05	< 0.05	0.10
Cadmium	0.01	0.002*	< 0.01	< 0.01	NA	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Silver	0.05	0.005*	Not Assessed										
Selenium	0.01	0.005	Not Assessed										
Chromium VI	0.05	0.003'	Not Assessed										
pH	NA	7.5	8.3	NA	8.7	8.6	8.4	8.5	8.6	8.5	8.2	7.9	8.2
cific Conductance			1200	NA	3100	3200	4100	2450	2800	2100	1600	8200	1750
Sulfates			915	NA	1183	1012	508	NA	375	234	323	1295	349
Iron			1.69	3.87	1.95	1.88	1.89	0.82	2.13	< 0.01	0.47	0.40	0.41

* At or below detection limit
' Not detected

APPENDIX C



FLOOD HAZARD BOUNDARY MAP

SCOTTS BLUFF COUNTY, NEBRASKA

UNINCORPORATED AREA

PAGE 7 OF 10

(SEE MAP INDEX FOR PAGES NOT PRINTED)

EFFECTIVE DATE:
FEBRUARY 7, 1978

A PART OF
COMMUNITY - PANEL NO.
310473 0007 A

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

APPENDIX D

LOCKWOOD CORPORATION

TO: Dick White
FROM: Roy R. Dugan
DATE: June 4, 1988
SUBJECT: Post-Closure Financial Assurance

Below are the current post-closure cost estimates for the remainder of the required 30 year post-closure period:

Sample Collection and shipping		$1,160.00
Semi-Annual Laboratory Analysis		$3,840.00
Annual Laboratory Analysis		$1,440.00
Data Tabulation and Reporting		$500.00
Site Inspection and Maintenance		$600.00
YEAR 2 (1988)	Total:	$7,540.00
Year 3 (1989)		$7,540.00
Year 4 (1990)		$5,860.00
Year 5 (1991)		$5,860.00
Years 6 - 30 (25 years) ($600 / year)		$15,000.00
	Grand Total:	$41,800.00

Post-Closure Care cost estimates should be re-evaluated on a periodic basis as actual costs are available for a more accurate analysis.

APPENDIX E

TRUST AGREEMENT

THIS TRUST AGREEMENT (the "Agreement"), entered into as of this 8th day of August, 1988, by and between Lockwood Corporation, a Delaware corporation (the "GRANTOR"), and Scottsbluff National Bank and Trust Company, a national banking association (the "TRUSTEE").

W I T N E S S E T H:

WHEREAS, the United States Environmental Protection Agency, an agency of the United States Government ("EPA"), has established certain regulations applicable to the GRANTOR, requiring that an owner or operator of a hazardous waste management facility shall provide assurance that funds will be available when needed for closure and/or postclosure care of the facility.

WHEREAS, the GRANTOR has elected to establish a trust to provide all or part of such financial assurance for the facilities identified herein.

WHEREAS, the GRANTOR, acting through its duly authorized officers, has selected the TRUSTEE to be the trustee under this Agreement, and the TRUSTEE is willing to act as trustee.

NOW, THEREFORE, the GRANTOR and the TRUSTEE agree as follows:

Section 1. Definitions. As used in this Agreement:

(a) The term "GRANTOR" means the owner or operator who enters into this Agreement and any successors or assigns of the GRANTOR.

(b) The term "trustee" means the TRUSTEE who enters into this Agreement and any successor trustee.

Section 2. Identification of Facilities and Cost Estimates. This Agreement pertains to the facilities and cost estimates identified on Schedule A attached hereto.

Section 3. Establishment of Fund. The GRANTOR and the TRUSTEE hereby establish a trust fund, the "Fund," for the benefit of EPA. The GRANTOR and the TRUSTEE intend that no third party have access to the Fund except as herein provided. The Fund is established initially as consisting of the property, which is acceptable to the TRUSTEE, described in Schedule B attached hereto. Such property and any other property subsequently transferred to the TRUSTEE is referred to as the Fund, together with all earnings and profits thereon, less any payments or distributions made by the TRUSTEE pursuant to this Agreement. The Fund shall be held by the TRUSTEE, IN TRUST, as hereinafter provided. The TRUSTEE shall not be responsible nor shall it undertake any responsibility for the amount or adequacy of, nor any duty to collect from the GRANTOR, any payments necessary to discharge any liabilities of the GRANTOR established by EPA.

Section 4. Payment for Postclosure Care. The TRUSTEE shall make payments from the Fund as the EPA Regional Administrator shall direct, in writing, to provide for the payment of the costs of postclosure care of the facilities covered by this Agreement. The TRUSTEE shall reimburse the GRANTOR or other persons as specified by the EPA Regional Administrator from the Fund for postclosure expenditures in such amounts as the EPA Regional Administrator shall direct in writing. In addition. The TRUSTEE shall refund to the GRANTOR such amounts as the EPA Regional Administrator specifies in writing. Upon refund, such funds shall no longer constitute part of the Fund as defined herein.

Section 5. Payments Comprising the Fund. Payments made to the TRUSTEE for the Fund shall consist of cash or securities acceptable to the TRUSTEE.

Section 6. TRUSTEE Management. The TRUSTEE shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines which the GRANTOR may communicate in writing to the TRUSTEE from time to time subject, however, to the provisions of this section. In investing, reinvesting, exchanging, selling and managing the Fund, the TRUSTEE shall discharge its duties with respect to the trust fund solely in the interest of the beneficiary and with the care, skill, prudence and diligence under the circumstances then prevailing which persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims; except that:

(a) Securities or other obligations of the GRANTOR, or any other owner or operator of the facilities, or any of their affiliates as defined in the Investment Company Act of 1940, as amended, 15 U.S.C. 80a-2.(a), shall not be acquired or held unless they are securities or other obligations of the federal or state government;

(b) The TRUSTEE is authorized to invest the Fund in time or demand deposits of the TRUSTEE to the extent insured by an agency of the federal or state government; and

(c) The TRUSTEE is authorized to hold cash awaiting investment or distribution uninvested for a reasonable time and without liability for the payment of interest thereon.

Section 7. Commingling and Investment. The TRUSTEE is expressly authorized in its discretion:

(a) To transfer from time to time any or all of the assets of the Fund to any common, commingled or collective trust fund created by the TRUSTEE

in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and

(b) To purchase shares in any investment company registered under the Investment Company Act of 1904, 15 U.S.C. 80a-1, et seq., including one which may be created, managed, underwritten, or to which investment advice is rendered or the shares of which are sold by the TRUSTEE. The TRUSTEE may vote such shares in its discretion.

Section 8. Express Power of Trustee. Without in any way limiting the powers and discretions conferred upon the TRUSTEE by the other provisions of this Agreement or by law, the TRUSTEE is expressly authorized and empowered:

(a) To sell, exchange, convey, transfer or otherwise dispose of any property held by it, by public or private sale. No person dealing with the TRUSTEE shall be bound to see to the application of the purchase money or to inquire into the validity or expediency of any such sale or other disposition;

(b) To make, execute, acknowledge and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted;

(c) To register any securities held in the Fund in its own name or in the name of a nominee and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the TRUSTEE in other fiduciary capacities, or to deposit or arrange for the deposit of such securities in a qualified central depositary even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee of such depositary with other securities deposited therein by another person, or to deposit or arrange for the deposit of

any securities issued by the United States Government, or any agency or instrumentality thereof, with a Federal Reserve bank, but the books and records of the TRUSTEE shall at all times show that all such securities are part of the Fund;

(d) To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the TRUSTEE, in its separate corporate capacity, or in any other banking institution affiliated with the TRUSTEE, to the extent insured by an agency of the federal or state government; and

(e) To compromise or otherwise adjust all claims in favor of or against the Fund.

Section 9. Taxes and Expenses. All taxes of any kind that may be assessed or levied against or in respect of the Fund and all brokerage commissions incurred by the Fund shall be paid from the Fund. All other expense incurred by the TRUSTEE in connection with the administration of this trust, including fees for legal services rendered to the TRUSTEE, the compensation of the TRUSTEE to the extent not paid directly by the GRANTOR, and all other proper charges and disbursements of the TRUSTEE shall be paid from the Fund.

Section 10. Annual Valuation. The TRUSTEE shall annually, at least thirty (30) days prior to the anniversary date of establishment of the Fund, furnish to the GRANTOR and to the appropriate EPA Regional Administrator a statement confirming the value of the trust. Any securities in the Fund shall be valued at market value as of no more than sixty (60) days prior to the anniversary date of establishment of the Fund. The failure of the GRANTOR to object in writing to the TRUSTEE within ninety (90) days after the statement has been furnished to the GRANTOR and the EPA Regional Administrator shall

constitute a conclusively binding assent by the GRANTOR, barring the GRANTOR from asserting any claim or liability against the TRUSTEE with respect to matters disclosed in the statement.

Section 11. Advice of Counsel. The TRUSTEE may from time to time consult with counsel, who may be counsel to the GRANTOR, with respect to any question arising as to the construction of this Agreement or any action to be taken hereunder. The TRUSTEE shall be fully protected, to the extent permitted by law, in acting upon the advice of counsel.

Section 12. TRUSTEE Compensation. The TRUSTEE shall be entitled to reasonable compensation for its services as agreed upon in writing from time to time with the GRANTOR.

Section 13. Successor Trustee. The TRUSTEE may resign or the GRANTOR may replace the TRUSTEE, but such resignation or replacement shall not be effective until the GRANTOR has appointed a successor trustee and this successor accepts the appointment. The successor trustee shall have the same power and duties as those conferred upon the TRUSTEE hereunder. Upon the successor trustee's acceptance of the appointment, the TRUSTEE shall assign, transfer and pay over to the successor trustee the funds and properties then constituting the Fund. If for any reason the GRANTOR cannot or does not act in the event of the resignation of the TRUSTEE, the TRUSTEE may apply to a court of competent jurisdiction of the appointment of a successor trustee or for instructions. The successor trustee shall specify the date on which it assumes administration of the trust in a writing sent to the GRANTOR, the EPA Regional Administrator and the present TRUSTEE by certified mail ten (10) days before such change becomes effective. Any expenses incurred by the TRUSTEE as a result of any of the acts contemplated by this section shall be paid as provided in Section 9.

Section 14. Instructions to the TRUSTEE. All orders, requests and instructions by the GRANTOR to the TRUSTEE shall be in writing signed by such persons as are designated in Exhibit A attached hereto or such other designees as the GRANTOR may designate by amendment to Exhibit A. The TRUSTEE shall be fully protected in acting without inquiry in accordance with the GRANTOR's orders, requests and instructions. All orders, requests and instructions by the EPA Regional Administrator to the TRUSTEE shall be in writing, signed by the EPA Regional Administrators of the Regions in which the facilities are located, or their designees, and the TRUSTEE shall act and shall be fully protected in acting in accordance with such orders, requests and instructions. The TRUSTEE shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the GRANTOR or EPA hereunder has occurred. The TRUSTEE shall have no duty to act in the absence of such orders, requests and instructions from the GRANTOR and/or EPA except as provided for herein.

Section 15. Notice of Nonpayment. The TRUSTEE shall notify the GRANTOR and the appropriate EPA Regional Administrator, by certified mail within ten (10) days following the epxiration of the thirty (30) day period after the anniversary of the establishment of the trust, if no payment is received from the GRANTOR during that period. After the pay-in period is completed, the TRUSTEE shall not be required to send a notice of nonpayment.

Section 16. Amendment of Agreement. This Agreement may be amended by an instrument in writing executed by the GRANTOR, the TRUSTEE and the appropriate EPA Regional Administrator, or by the TRUSTEE and the appropriate EPA Regional Administrator if the GRANTOR ceases to exist.

Section 17. Irrevocability and Termination. Subject to the right of the parties to amend this Agreement as provided in Section 16, this trust shall be irrevocable and shall continue until terminated at the written agreement of the GRANTOR, the TRUSTEE and the EPA Regional Administrator, or by the TRUSTEE and the EPA Regional Administrator if the GRANTOR ceases to exist. Upon termination of the trust, all remaining trust property, less final trust administration expenses, shall be delivered to the GRANTOR.

Section 18. Immunity and Indemnification. The TRUSTEE shall not incur personal liability of any nature in connection with any act or omission, made in good faith, in the administration of this trust, or in carrying out any directors by the GRANTOR or the EPA Regional Administrator issued in accordance with this Agreement. The TRUSTEE shall be indemnified and saved harmless by the GRANTOR or from the trust Fund, or both, from and against any personal liability to which the TRUSTEE may be subjected by reason of any act or conduct in its official capacity including all expenses reasonably incurred in its defense in the event the GRANTOR fails to provide such defense.

Section 19. Choice of Law. This Agreement shall be administered, construed and enforced according to the laws of the State of Nebraska.

Section 20. Interpretation. As used in this Agreement, words in the singular include the plural and words int he plural include the singular. The descriptive headings for each section of this Agreement shall not affect the interpretation or the legal efficacy of this Agreement.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed by their respective officers duly authorized and their corporate seals to be hereunto affixed and attested as of the date first above written. The parties below certify that the wording of this Agreement is identical to the

wording specified in 40 CFR 264.151(a)(1) as such regulations were constituted on the date first above written.

LOCKWOOD CORPORATION,
A Delaware Corporation,

By _____
President
GRANTOR

SCOTTSBLUFF NATIONAL BANK AND TRUST COMPANY, A National Banking Association,

By _____
President
TRUSTEE

STATE OF NEBRASKA)
) ss.
COUNTY OF SCOTTS BLUFF)

On this 8th day of August, 1988, before me personally came C. H. McCall, President of Lockwood Corporation, to me known, who, being by me duly sorn did depose and say that he resides in Gering, Nebraska, that he is President of Lockwood Corporation, the corporation in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to such instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation; and that he signed his name thereto by like order.

GENERAL NOTARY-State of Nebraska
MARVIN D. ZEILER
My Comm. Exp. June 13, 1991

_____
Notary Public

My commission expires:

STATE OF NEBRASKA)
) ss.
COUNTY OF SCOTTS BLUFF)

On this 9th day of August, 1988, before me personally came John T. Selzer, President of Scottsbluff National Bank and Trust Company, to me known, who, being by me duly sorn did depose and say that he resides in Scottsbluff, Nebraska, that he is President of Scottsbluff National Bank and Trust Company, the corporation in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to such instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said corporation; and that he signed his name thereto by like order.

_____
Notary Public

GENERAL NOTARY-State of Nebraska
ELLEN J. SCHULDIES
My Comm. Exp. Aug. 23, 1991

My commission expires:

SCHEDULE A

EPA IDENTIFICATION NO.: NED044101442

NAME: Lockwood Corporation Waste Acid Evaporation Pond

ADDRESS: Highway 92 East
Post Office Box 160
Gering, Nebraska 63941

POSTCLOSURE COST ESTIMATES: $41,800.00

SCHEDULE B

$20,900.00 to be deposited on the date of the Trust Agreement

$20,900.00 to be deposited November 1, 1988

EXHIBIT A

Lockwood Corporation as GRANTOR in the foregoing Trust Agreement designates C. H. McCall as the person to sign all written orders, requests and instructions by the GRANTOR to the TRUSTEE pursuant to the Trust Agreement.

APPENDIX F

CLOSURE PLAN
FOR
LOCKWOOD CORPORATION
WASTE ACID EVAPORATION POND
EPA I.D. NO. NED044101442

IN ACCORDANCE WITH:

U.S. ENVIRONMENTAL PROTECTION AGENCY

RESOURCE CONSERVATION AND RECOVERY ACT

HAZARDOUS WASTE MANAGEMENT RULES AND REGULATIONS

40 CFR PARTS 264 & 265, SUBPARTS G & H

AND

NEBRASKA DEPARTMENT OF ENVIRONMENTAL CONTROL

RULES AND REGULATIONS GOVERNING HAZARDOUS WASTE MANAGEMENT

RULES NO. 30 & 31

JULY 1985

REVISED

SEPTEMBER 1985

PREPARED BY:

HOSKINS-WESTERN-SONDEREGGER, INC.
825 J STREET
LINCOLN, NEBRASKA 68501

CLOSURE PLAN

TABLE OF CONTENTS

INTRODUCTION

Lockwood Corporation proposes to close the waste acid evaporation pit facility at the Lockwood Corporation plant in the fall of 1985. Lockwood will close the facility in accordance with 40 CFR 265.111 and in a manner that (a) minimizes the need for further maintenance, and (b) controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post closure escape of hazardous waste, hazardous waste constituents, leachate, or waste decomposition products to the ground or surface waters or to the atmosphere.

In general, the closure of the facility will be completed in the following manner:

1. Removal of liquid, if present.
2. Demolition of existing dikes and removal of influent waste line.
3. Placement of lime and soil layer.
4. Installation of impermeable synthetic liner.
5. Placing and compacting clay soil cover and gravel stabilizing layer.
6. Installing security fence.

Closure of the facility will be initiated after approval by the Nebraska Department of Environmental Control (NDEC) and after the required public notice period has ended. Financial assurance will be provided and will continue to be provided until closure is complete.

Also, Certification of closure will be provided as required by the regulation. If any wastes are to be removed from the site, such wastes will be disposed of at an approved hazardous waste disposal site.

Groundwater monitoring of the facility will continue during the post-closure care period for facility.

CLOSURE PLAN

A. GENERAL

1. Lockwood will keep a written Closure Plan at the Lockwood Corporation Plant, (site of Waste Acid Evaporation Pond,) until all closure operations are completed, after which the Plan will become part of the Plant's permanent records.
2. The Plant Engineer (or other facility employee as designated by Lockwood) will be responsible for: maintaining the Plan; revising and updating the Plan as necessary; and, implementing the Plan at the time of Facility closure.
3. Records of Closure Plan revisions and updates will be retained at Lockwood for the care period of Closure and Post Closure. However, this retention period is automatically extended during the course of any unresolved enforcement action regarding the facility or as requested by the EPA Region VII Administrator or the Director of the Nebraska Department of Environmental Control (DEC).
4. The Closure Plan and related records will be furnished upon request and made available at all reasonable times for inspection by any officer, employee, representative, or designee of either the EPA or the Nebraska DEC.
5. Any revisions to the approved Closure and Post Closure Plan will be submitted to and approved by the Director of the Nebraska DEC and EPA Region VII Administrator.

6. The Regional Administrator can be contacted by writing:

   United States Environmental Protection Agency

   Region VII

   324 East 11th Street,

   Kansas City, Missouri 64106

7. The Director of the Nebraska DEC can be contacted by writing:

   State of Nebraska

   Director, Department of Environmental Control

   301 Centennial Mall South

   Lincoln, Nebraska 68509

8. It is the intention of this Closure Plan to meet the "Closure Performance Standard" as stated in 40 CFR 265.111.

B. FACILITY CONDITIONS

1. General Facility Information:

   a. The Lockwood Corporation plant is located on the southeast corner of the City of Gering, Scottsbluff County, Nebraska in the SE¼ of Section 1, Township 21 North, Range 55 West of the 6th P.M. Based upon Flood Insurance Rate Maps available for Scottsbluff County through the Federal Emergency Management Agency, none of the waste acid evaporation pond lies in the 100-year flood plain.

   The plant property is presently surrounded by agricultural land on the south and east sides, and industrial property on the west side and industrial and State Highway 92 on the north side. Attachment I is a Location Map showing approximate plant and Facility locations with respect to contours, highways and roads, etc.

   b. The subject of this Closure Plan, the Waste Acid Evaporation Pond Facility, is located southwest of the Galvanizing Building from which the acid waste is generated. The Facility consists of two (2) cells with a common dike separating the cells. The bottom dimensions of the south (Cell #1) and the north (Cell #2) are approximately 100 ft x 90± ft and 100 ft x 100 ft, respectively. Interior and exterior dikes have side slopes of 3:1.

   Construction records indicate that the north cell was constructed with a mixed soil and bentonite liner on the bottom and to an elevation of 3 feet above the bottom on the sloped

interior surfaces of the dikes. It is assumed that the south cell was unlined since no records were available on this cell and test borings were unable to determine the presence of a liner.

The south cell was placed into service in November 1972 and received wastes until February of 1978 at which time the north cell was constructed and placed into operation. The north cell received wastes from this time until June, 1984, when the discharges to the cell were stopped, as requested by Administrative Order.

In general, the wastes discharged to the cells consisted of a 5% to 15% solution of waste sulfuric acid from the corporations galvanizing process located in the galvanizing building. Typically the facility received an average of two (2) "batch type" discharges per month. The volume of an average discharge ranged between 5,000 to 8,000 gallons. The calculated capacity of the north cell was approximately 375,600 gallons and the south cell capacity was approximately 308,500 at an average liquid depth of 4.0 ft.

Since that time, all other waste acid from the galvanizing process has been shipped to an Oklahoma hazardous waste disposal site.

c. The Waste Acid Evaporation Pond Site Layout Plan with respect to adjacent buildings and structure, and the site elevation and estimated soils profile are shown in Attachments IIa. and IIb. and IIc. respectively.

2. Waste Characterization:

a. Lockwood Corporation initiated and conducted an extensive waste monitoring, sampling, and analysis program aimed at identifying the waste constituent concentrations and locations.

b. The primary waste stream to the Facility was waste sulfuric acid generated by the galvanizing process. Besides having an extremely low pH (Less than 2.5), the waste has high concentrations of zinc, iron, and sulfates, with lesser concentrations of lead, cadmium, chromium, sodium, and chlorides. No other known wastes have been discharged to the Facility in any significant or detectable quantities. The waste stream is classified K062 as defined by 40 CFR 261.

c. Based upon waste sampling and analyses in and around the Facility, it has been determined that there are three general areas of waste concentration with varying degrees of contamination. These are described as follows:

1.) Facility Bottom Sludges. As previously mentioned, the Facility presently contains a 2.5 to 3.0-foot layer of dry sludge resulting from accumulated precipitate and sediment from the waste stream. Samples of the bottom sludges were obtained between June 30 and July 12, 1984. Each of the cells were divided into four equal quadrants. A minimum of five (5) locations in each quadrant were selected at random for sample collection. At each of the selected locations representative samples of each vertical foot of sludge from the top of the existing sludge to the bottom soil and sediment were collected.

In general, samples were obtained by hand excavating the top 1 to 2 feet of material where possible and then driving a modified "Shelby Tube" type core sampling device into the remaining depth of sludge. The tube was driven until the lower soil and sediments would seal or plug the end of the tube allowing for extraction from the hole.

In sample locations where sludges were extremely hard, the top 1 to 2 feet were hand excavated and then the remaining depth was sampled using a gas-driven power type continuous flight auger. All of the sample locations in the south cell (Cell No. 1) were very hard and dry and the auger method was used.

The samples collected were dark brown, yellow, white to blue-green in color. Moisture concentrations for the samples varied from very dry and hard in the south cell to damp and wet in the north cell. The samples from each of the locations in each quadrant were then composited and analyzed as shown in Attachment III of the Appendix of this closure plan document.

These results indicate that all the samples contain characteristic E.P. Toxicity Metals concentration levels well below those established for hazardous waste. However, due to current RCRA regulations, these wastes are classified as K062 hazardous wastes.

The Facility bottom sludge will be included in the "waste inventory" for this Closure Plan.

2.) Contaminated Site Soils. Soils beneath the Facility will be addressed by the "Post Closure Plan" and will not be included in the waste inventory of the Closure Plan.

3.) Groundwater. Groundwater in the area of the Facility also will be addressed by the "Sampling and Analysis" plan for groundwater as outlined in the Post Closure Plan and will not be included in the waste inventory of the Closure Plan.

C. SCHEDULE OF FINAL CLOSURE

1. The projected schedule for final closure of the Lockwood Waste Acid Evaporation Pond shall be in accordance with the following. The days stated for each item are the number of days after receiving approval of the closure plan from NDEC.

Item	Days After Date of Approval
a. Start of Closure Operations	30
b. Complete Closure	180
c. Certify Closure	210

2. The Facility Owner or his designated representative may amend the project closure schedule at any time during the active life of the facility. Any revisions to the closure plan will be submitted to and approved by the Director of the Nebraska D.E.C.

D. FACILITY INVENTORY

1. In accordance with the R.C.R.A. regulations for Closure Plans, the maximum amount of waste inventory on-site at the Facility shall consist of the Facility Bottom Sludge. In general, the Facility sludge and soils are described as follows:
   a. Sludge: Dark gray, white, or yellow or blue-green in color with some light brown (iron) areas and layers; crystalline structure when dry and very soft in consistency when moist to wet with no developed soil structure.
   b. Soils: Silty clay, possibly some sandy clay, dark brown in color when wet, stiff in consistency and wet, with a well developed soil structure.
2. Any water standing in the pit at the time of closure shall not be considered part of the waste inventory, and shall be pumped to disposal site containers for disposal at an approved hazardous waste site prior to the start of closure operations.
3. Based on the sludge samples collected, sludge depths averaged 2.8 feet deep in the south cell and 3.0 feet deep in the north cell.
4. In addition, it will be assumed that approximately 2.0 feet of soil on the Facility's sides and bottom and the total inner dike soil are contaminated sludge. Thus, the total calculated waste inventory volume shall be assumed to be a maximum of 5,100 cubic yards.

E. TREATMENT OF FACILITY INVENTORY

The following is a step-by-step description of the procedures and actions that will be taken in closing the Facility. A general contractor selected by Lockwood Corporation will perform the work described in this section.

1. Removal of standing water.

   If present in the Facility, standing water will be removed by pumping and discharging to the existing Neutralization Tank.

2. Demolish Existing Earth Dikes.

   Existing exterior and interior dikes will be demolished by pushing in the dikes over top of the existing sludge. The existing waste acid inlet pipe line will be removed to 10 feet outside of the exterior dike and plugged and abandoned.

3. Construction of Alkaline/Soil Layer

   A layer of lime followed by compacted clay soil will be placed over the top of the sludge and pushed-in-dike material to ensure alkaline (high pH) conditions are maintained above the existing sludge deposits and dike area. Hydrated lime will be spread at the rate of 200 lbs. per 1000 square feet over the top of the sludge in the both cells and and the interior dike (approximately 130 feet x 250 feet area). The lime layer will then be covered by a 6-inch to 1.0 foot thick compacted layer (approx.) of silty-clay (non-dispersive) soil. The surface of this layer will be uniformly sloped and smooth graded to the lines and grades shown in Attachment II of the Appendix.

4. Final Cover

a. Final Cover The area of the facility to be covered consists of the area bounded by the exterior dikes of the two cells. The dimensions of this area is approximately 130 feet wide (East-West) by 250 feet long (North-South).

b. Cover Characteristics

1) The final cover will be sloped and consist of the following materials to prevent surface water infiltration and pooling:

a) Impermeable synthetic top liner

b) Protective compacted clay soil cover layer over the synthetic liner

c) Gravel stabilizing final surface layer

2) Materials

a) Synthetic Liner. The synthetic liner will be a commercially available 20 mil thick (0.020 inch) polyvinyl chloride (PVC). The liner will be black in color and be fabricated in two (2), 70 feet x 260 feet (approx.) pieces. The liner material is resistant to degradation from the alkaline soils that will be used for the cover operation.

b) Cover (Fill) Soil.

(1) The soil to be used for the cover over the liner will be a silty-clay obtained from a local off-site borrow pit. The material will be a non-dispersive inorganic silty-clay material free of refuse, stones or clods larger that 3

inches maximum dimension, vegetation and other perishable material. Haul distance from the borrow pit to the Facility Site is approximately 5 miles.

(2) The acceptability of non-dispersive borrow material will be determined by using the standard "Crum Test" (Ref: USDA Soil Conservation Service, Soil Mechanics Note 8 and ASCE Journal of Geotechnical Engr., April, 1976. Compaction characteristics will be evaluated using ASTM §9American Society of Testing Materials) method D1557.

(3) The thickness of the cover material over the liner will range between 1.5 feet to 2.0 feet to protect the liner from ultraviolet light and physical damage from construction equipment or other possible sources. The surface will be sloped to the contour elevations as shown on the Plan and Cross-sections of Attachment II in the Appendix. Approximately 3,000 cubic yards of material will be required for the cover layer. The permeability of the compacted cover layer is estimated to range between 10^{-5} cm/sec. to 10^{-7} cm/sec.

c). Gravel. Gravel for the final stabilization layer on top of the soil cover will have a size range of one (1) to two (2) inches and will be obtained from locally available sources. A two (2) inch thickness will be applied over the total area of the cover.

c. Final Cover Design.

1) The design of the cover is shown in Attachment II of the Appendix to this Closure Plan.

2) Slope. The slope of the cover will be a minimum of 2% on the top area and four (4) foot horizontal to one (1) foot vertical around the perimeter of the exterior dikes.

3) Length of Run on Slope. The maximum length of run at the 2% slope will be approximately 70 feet.

d. Procedures for Placing and Installing Final Cover.

1) Synthetic (PVC) Liner Placement.

(a) Prior to placing the synthetic liner, the top of the lower alkaline-soil layer will be graded smooth to the 2% slope shown and inspected to be free of roots, stones, rocks and other sharp or angular objects.

(b) The two pieces of synthetic liner will be placed in the longitudinal, north-south direction. The seam at the north-south centerline of the two cells will be overlapped approximately 5 feet to prevent entry of seepage water. The perimeter edges of the liner will be anchored (keyed) into the existing exterior earthen dikes as shown on the cross-sections in

Attachment II. Temporary soil ballast will be placed at selected locations to prevent displacement by wind until placement of final cover, if required.

2) Protective Soil Cover.

(a) Upon completing installation of the liner, the protective soil cover layer will be installed. Silty-clay borrow material will be carefully placed by earth moving equipment to a minimum 8 to 12 inch thicknesses before any compaction efforts are performed.

(b) Compaction of the soil will be accomplished in 8 to 12 inch layers by compaction rollers and earth spreading equipment. The soils will be wetted or dried by aeration, if required, and compacted to the specified limits stated herein.

(c) Cover shall be placed to a 1'-4" thickness over the liner and to the surface contour elevations and slopes shown on Attachment II. The final surface shall be graded smooth to prevent ponding.

(d) Soil Testing. Soil tests will be performed on each lift of soil cover material placed to ensure the degree of compaction as stated herein after is met.

3) Gravel Stabilization Layer. A final 2 inch thick (minimum) layer of gravel will be uniformly placed over the top of the soil cover and exterior surface of the dikes to the limits shown in Attachment II. Additionally, periodic

inspection of the facility will be conducted during the closure period and if any deterioration of cover occurs, it will be repaired using similar materials.

5. Soil Compaction and Testing

a. Degree of Compaction.

1) All fill and soil cover will be compacted to meet the following limits:

Material	Moisture Content	Minimum Degree of Compaction
Silty Clay	Near Optimum	82% of Maximum Dry Density

2) These materials will be moistened or dried, if necessary, and compacted so that each layer meets the moisture content and degree of compaction stated above.

b. Soil Testing

1) Soil tests for moisture and degree of compaction will be performed by qualified soils testing personnel on each 8-inch lift of soil placed and compacted.

2) A minimum of two (2) soil compaction tests will be performed for each 6-inch compacted lift. Soil tests will be performed in accordance with approved test methods.

3) Compacted fill and soil cover that does not meet the requirements will be reworked or removed and properly replaced.

6. The type and minimum number of pieces of equipment expected to perform closure operations shall be as follows:

   a. 1 - Front End Loader - Rubber Tired Type

   b. 1 - Compactor - Roller Type

   c. 1 - Motor Grader

   d. 8 - Dump Trucks for Borrow Soil Hauling

7. The schedule for the above mentioned closure operations shall be as outlined in Section C of this Plan.

F. FACILITY DECONTAMINATION

Due to the nature of this Closure operation and the relatively low hazard of the wastes involved, limited decontamination of the equipment used for closure will be as follows:

1. Equipment.

    a. Equipment used to excavate, move, and compact waste inventory will be physically scraped and brushed clean of waste materials at the Facility site each time prior to leaving the areas. This will be done without the use of water. These materials will be disposed of with the other inventory.

G. CLOSURE CERTIFICATION

1. When closure is completed, Lockwood and an independent registered professional engineer will provide certification as prescribed by 40 CFR 265.115.
2. See the Appendix and Attachment for a copy of the form for "Certification of Final Closure".

H. FACILITY FENCING

1. Existing Fence.

   a. Galvanized steel chain link perimeter fencing exists along the Lockwood Plant property boundaries. The Facility is bounded on the west and south sides by this fence (See Attachment II).

   b. The existing chain link fence is an 8 foot high industrial security fence with galvanized wire fabric and posts.

   c. The existing fencing is in good condition and will be inspected when post closure begins to ensure that it is in good condition.

2. New Fencing.

   a. New perimeter chain link fencing will be installed along the north and east sides to enclose the Facility. Fencing will be installed at the location shown on Attachment II in the Appendix.

   b. The chain link fencing will be the same as the existing perimeter chain link fencing. An access gate will be installed to allow entrance to the Facility for maintenance and post closure activities. Locks will be installed on the access gate opening.

3. Signs. The perimeter property fencing is currently signed. Additional signs as required by the regulatory agency will be installed on the facility perimeter fence at the start of the post closure period.

I. COST ESTIMATE FOR FACILITY CLOSURE

1. An estimate of the cost of closing the Lockwood Corporation Waste Acid Evaporation Pond in accordance with the procedures described herein, is shown in Table 3 to follow.
2. The Facility Owner or his designee will prepare a new closure cost estimate whenever a change in the Closure Plan affects the cost of closure. Such changes will be recorded in Table 3.

TABLE NO. 3

OPINION OF PROBABLE CLOSURE COSTS

LOCKWOOD WASTE ACID EVAPORATION PIT

Item	Quantity	Unit	Unit Cost	Estimated* Amount
Excavation of Dikes	400	CY	$3.00	$ 1,200
Lime	3.3	TN	$200	660
Synthetic Liner	32,500	SF	$0.30	9,750
Clay Soil Cover and Fill, Including Borrow	3000	CY	$4.00	12,000
Gravel	300	TON	$7.00	2,100
Soil Testing	--	Lump Sum	$1,500	1,500
Fencing	455	LF	$10.00	4,550
Engineering & Inspection	--	Lump Sum	$2,500	2,500
Miscellaneous	--	Lump Sum	$1,000	1,000
Waste Sampling & Analysis	--	Lump Sum	$500	500
Contingency	--	Lump Sum	$3500	3500
TOTAL: OPINION OF PROBABLE CLOSURE COSTS				$39,260*

* NOTE: Costs Include Contract Labor and Equipment.

The above opinion of closure costs do not include the costs for Groundwater Monitoring. These costs will be covered in the Post Closure Plan, groundwater monitoring plan.

J. FINANCIAL ASSURANCE

1. Lockwood will establish financial assurance for closure of the Lockwood Waste Acid Evaporation Pond by one of the methods as described in 40 CFR 265, subpart H.

APPENDIX

CLOSURE PLAN

ATTACHMENTS

I. WASTE ACID EVAPORATION POND LOCATION MAP

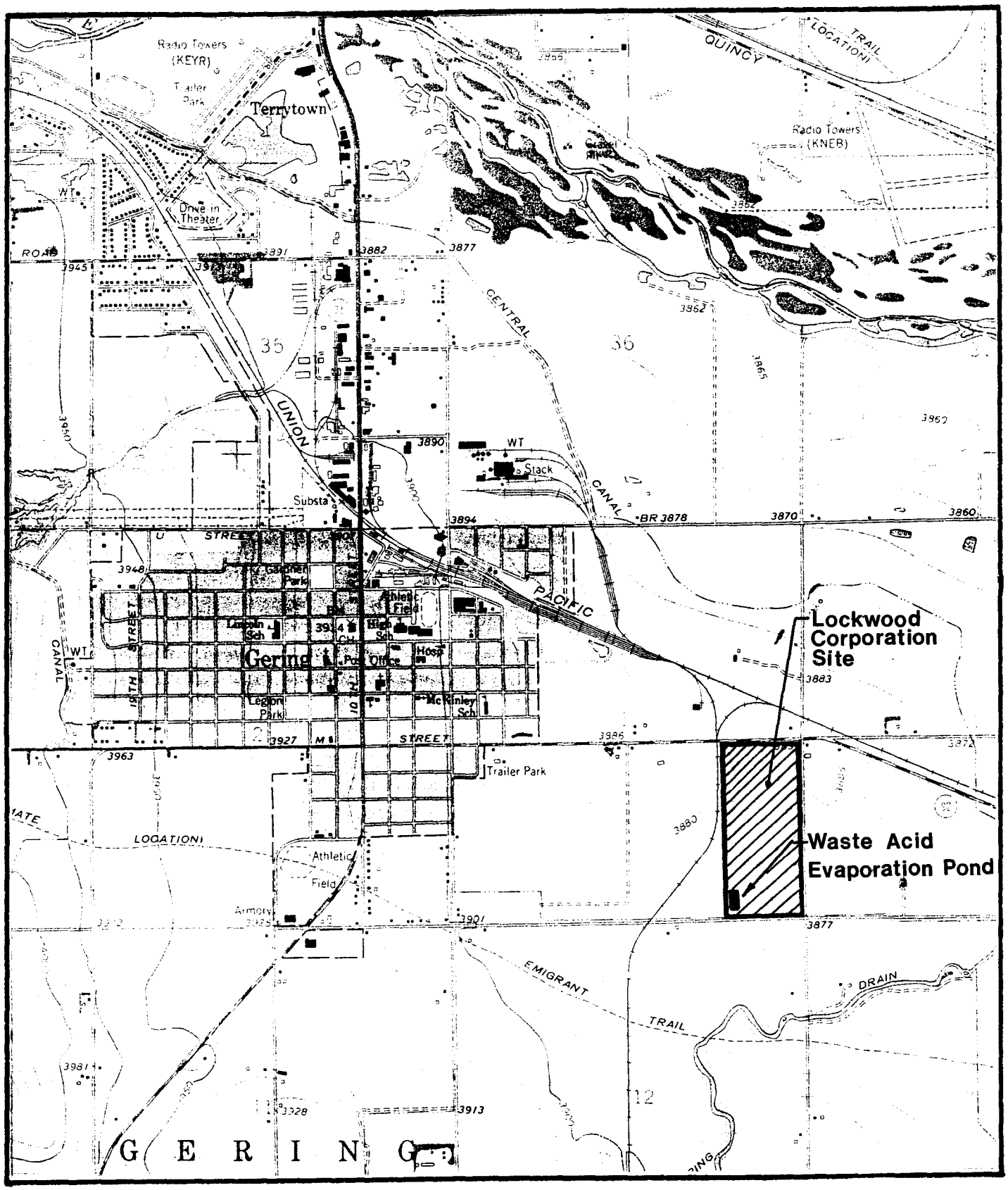
IIa. PLAN - WASTE ACID EVAPORATION POND

IIb. WASTE ACID EVAPORATION POND CROSS-SECTION

IIc. GEOLOGIC CROSS-SECTION

III. FINANCIAL ASSURANCE DOCUMENTS

IV. CERTIFICATION OF FINAL CLOSURE



N

SCALE: 1" = 2000'

LOCKWOOD CORPORATION

WASTE ACID EVAPORATION POND LOCATION MAP

ATTACHMENT I

ATTACHMENT III

FINANCIAL ASSURANCE DOCUMENTS

(To Be Included Upon Availability)

CERTIFICATION OF FINAL CLOSURE

OWNER'S CERTIFICATION

I, _____, of
(Owner's Name)

_____
(Name and Address of Hazardous Waste Facility)

hereby state and certify that, to the best of my knowledge and belief, the above-named hazardous waste facility has been closed in accordance with the attached approved Closure Plan, and that the closure was completed on the ____ day of _____, 19___.

_____ _____
Signature Date

ENGINEER'S CERTIFICATION

I, _____, a
(Engineer's Name)
certified professional engineer, hereby certify, to the best of my knowledge and belief, that I have verified all prior closure activities at _____ and
(Hazardous Waste Facility)
that I have made visual inspections of the aforementioned facility, and closure of the aforementioned Facility has been performed in accordance with the Closure Plan for the Facility approved by the Director of the Nebraska Department of Environmental Control.

_____ _____
Signature Date

Licensed Professional Engineer No. _____ In the State of _____

_____
Business Address City State Zip Phone No.

ATTACHMENT IV

APPENDIX G

AFFIDAVIT

STATE OF NEBRASKA)
) ss.
COUNTY OF SCOTTS BLUFF)

C. H. McCall, being first duly sworn, deposes and states as follows:

1. That he is the President of Lockwood Corporation, a Delaware corporation, whose address is Highway 92 East, Post Office Box 160, Gering, Nebraska 69341.

2. In accordance with that certain Lease and Agreement dated September 1, 1968, and pursuant to City of Gering, Nebraska, Industrial Development Revenue Bonds - Series A (Lockwood Corporation Project), Lockwood Corporation leases and occupies the following-described real estate:

> A part of the Southeast Quarter (SE¼) of Section One (1), Township Twenty-one (21) North, Range Fifty-five (55) West of the 6th P.M., Scotts Bluff County, Nebraska, more particularly described as follows: Beginning at a point 50 feet South of the Northeast corner of said SE¼ and on the East line of said SE¼; thence South on the East line of said SE¼ a distance of 1395.05 feet; thence West and parallel with the North line of said SE¼ a distance of 1253.12 feet to the East right-of-way line of the Union Pacific Railroad spur track; thence angle right 90°13' along said right-of-way line a distance of 1395.05 feet to the South right-of-way line of Nebraska State Highway No. 92; thence angle right 89°47' a distance of 1167.01 feet; thence angle right 16°12' a distance of 82.46 feet; thence angle left 106°16' a distance of 23 feet; thence angle right 90°04' a distance of 33 feet to the point of beginning containing 40.0 acres together with improvements and appurtenances thereon and thereunto belonging.

3. There is located on such real estate a waste acid evaporation pond to which the United States Environmental Protection Agency has assigned identification number NED044101442, such pond being located in the southwest corner of such real estate.

4. Lockwood Corporation has complied with all laws, rules and regulations applicable to such pond for the closure thereof and for postclosure care.

FURTHER AFFIANT SAITH NOT.

C. H. McCall

SUBSCRIBED AND SWORN TO before me this 1th day of August, 1988.

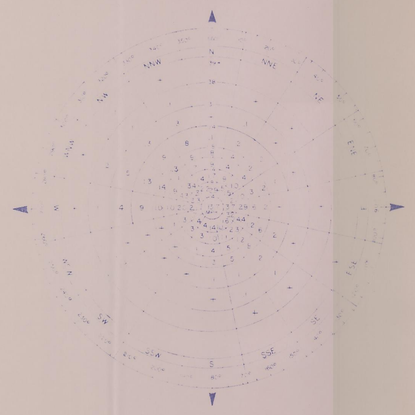
GENERAL NOTARY-State of Nebraska
MARVIN D. ZELLER
My Comm. Exp. June 13, 1991

Notary Public

My commission expires:

$10.50
Lockwood Corp.

State of Nebraska, Scotts Bluff County ss.
Entered in Numerical Index and filed for record the 9 day of August, 1988 at 1:35 o'clock P M., and recorded in Book 121 of Miscellaneous on page 680
Mary Jo Ellis
Register of Deeds
By Pauline C. Hays Deputy



WIND ROSE
FROM
CURRENTLY APPROVED AIRPORT LAYOUT PLAN
SCOTTS BLUFF COUNTY AIRPORT
3-25-88

Auto Salvage Yard
Farmsteads
Private Well
County Rd
Farmsteads
Private Well
Property Line
2450.3
Chain-Link Security Fence
Waste Oil Storage Area
Parking Lot
Street
Hazardous Waste Storage Area
Chain-Link Security Fence
Security Guardhouse
Scrap Metal Waste Bins
Pipe Fabrication
Galvanizing Plant
Fin Fl 80.20
Effluent Tank
Property Line
1193.1'
Chain Plant
Fabrication Plant
Vacated
Parking Lot
Raw Product Storage Area
Solvent Recycling System
Warehouse
Fin Fl 84.33
Waste Acid Evaporation Ponds Closed
Chain-Link Security Fence
Property Line
1534.3'
Hwy 92
Chain-Link Security Fence
2460.5'
Union Pacific RR Spurs
Municipal Well
INDUSTRIAL
TRACT
Farmstead
Irrigation Canal
Union Pacific RR
Farmstead
Farmstead
& Gering Drain

Revised 6-89

TOPO MAP

POST CLOSURE PERMIT
LOCKWOOD CORPORATION
GERING, NEBRASKA

825 J Street
P.O. Box 80358
Lincoln, NE 68501
Phone: (402) 475-4241
HWS Engineering Inc.

SCALE 1"=200'
DATE March 88
JOB NO. 17/5002/101
FIELD BOOK 1529
FILE NO.
SHEET NO. 1/1